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ERRATA.

Page 21 line 42 for "*pruni*, Koch," read "*helichrysi*, Kalt. (*pruni*, auctt.)"
,, 28 ,, 11 ,, "*crematus*" ,, "*cremastus*"
,, 30 last line for "arsenate" ,, "arsenite"
,, 40 line 42 for "*numeralis*" ,, "*humeralis*"
,, 43 ,, 21 ,, "*Euphoria*" ,, "*Euphorbia*"
,, 73 ,, 4 ,, "*Aphis sorbi*" ,, "*Anuraphis roseus*"
,, 73 ,, 5 ,, "Kalt." ,, "Baker"
,, 79 ,, 16 ,, "*fascellaria*" ,, "*fiscellaria*"
,, 86 ,, 8 ,, "*ipsilon*" ,, "*ypsilon*"
,, 101 ,, 4 ,, "*Oencyrtus*" ,, "*Ooencyrtus*"
,, 101 ,, 29 ,, "Dyar" ,, "Wlk."
,, 108 5 lines from end "Aberhalden" ,, "Abderhalden"
,, 128 line 4 for "*glycyphaga*" ,, "*glyciphaga*"
,, 129 ,, 42 ,, "Had." ,, "Hag."
,, 138 ,, 26 ,, "adults" ,, "larvae"
,, 143 ,, 16 ,, "*Brachytrypus*" ,, "*Brachytrypes*"
,, 148 ,, 23 ,, "" *Erinnys*" ,, "*Erinnyis*"
,, 149 ,, 9 ,, "*prenides*" ,, "*prenidis*"
,, 149 ,, 17 ,, "*Lecanobius*" ,, "*Lecaniobius*"
,, 187 ,, 26 ,, "Smith (K. L.)" ,, "Smith (K. M.)"
,, 198 ,, 43 ,, "*melanotatus*" ,, "*melanobatus*"
,, 213 ,, 1 ,, "Dovnar-Zapol'skiĭ (D.P.)" read "Dovnar-Zapol'skiĭ (D.P.) & Romanova (V.P.)"
,, 221 line 8 for "*Tiere*, Abt. A, v." read "*Tiere*, v,"
,, 266 ,, 3 ,, "*viridis*" ,, "*viridius*"
,, 266 ,, 6 ,, "*Oliarius*" ,, "*Oliarus*"
,, 270 ,, 23 ,, "432°" ,, "464°"
,, 273 ,, 30 "276" ,, "246"
,, 306 ,, 28 ,, "proved very effective" read "proved very effective as a repellent for the adults."
,, 307 ,, 28 for "M[artinot]" read "M[artinet]"
,, 310 ,, 43 ,, "*pectinata*" ,, "*pectinatae*"
,, 313 ,, 10 ,, "Trapmann" ,, "Trappmann"
,, 324 ,, 4 ,, "*Diaparopsis*" ,, "*Diparopsis*"
,, 333 ,, 37 ,, "*Metaponia*" ,, "*Metoponia*"
,, 342 ,, 44 ,, "*lethieryi*" ,, "*lethierryi*"
,, 357 6 lines from end for "*Oencyrtus*" read "*Ooencyrtus*"
,, 365 line 13 for "A, xiii" read "A, xii"
,, 371 ,, 10 ,, "Rennie (G.)" ,, "Rennie (J.)"
,, 374 ,, 6 ,, "*masi*" ,, "*masii*"
,, 378 ,, 23 ,, "*Pithyophthorus*" ,, "*Pityophthorus*"
,, 386 ,, 28 ,, "Brachinid" ,, "Braconid"
,, 393 ,, 4 ,, "**Дучник**" ,, "**Лучник**"
,, 394 ,, 31 ,, "**Даллин**" ,, "**Лаппин**"
,, 394 ,, 40 ,, "**Довнар-Заиолский**" ,, "**Довнар-Запольский**"
,, 395 ,, 1 ,, "**Эверезмб-Зубовский**" read "**Зверезомб-Зубовский**"
,, 400 ,, 12 ,, "*Anuraphis malifoliae*, Fitch" read "*Anuraphis roseus*, Baker (*malifoliae*, auctt.)"

Page 424 line 43 for " *cribaria* " read " *cribraria* "
,, 433 ,, 17 ,, " BAUNACHE " ,, " BAUNACKE "
,, 440 ,, 27 ,, " *saccarhinum* " ,, " *saccharinum* "
,, 444 ,, 34 ,, " *Corythucha* " ,, " *Corythuca* "
,, 501 ,, 3 ,, " *platyhyphenae* " , " *platyhypenae* "
,, 501 ,, 8 ,, " *Ailomorphus* " ,, " *Aiolomorphus* "
,, 503 ,, 20 ,, " Donysz " ,, " Danysz "
,, 554 7 lines from end for " *Sandalum* " read " *Santalum.* "
,, 588 line 5 for " TRÄGRÅDH " read " TRÄGÅRDH "
,, 590 last line for " cyanamide " ,, " cyanide "
,, 598 line 9 for " *xylophagus* " ,, " *xylographus* "
,, 615 ,, 13 ,, " *Raphitelus* " ,, " *Rhaphitelus* "
,, 615 ,, 15 ,, " *Exthecus* " ,, " *Exothecus* "

IMPERIAL BUREAU OF ENTOMOLOGY.

REVIEW
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SERIES A.

VOL. XIV.] [1926.

EDITORIAL.

As particulars of the number of abstracts in the two series of the *Review of Applied Entomology* were last published in volume iv and as ten years have now elapsed, the following table showing the number of articles abstracted in the *Review* during the past three years, grouped under the countries in which they were published, may be of interest for purposes of comparison. The figures recorded in volume iv were 1,037 (1913), 1,494 (1914), and 1,773 (1915).

	1923.	1924.	1925.
Africa, British (including Egypt, Mauritius and Seychelles)	80	106	131
Africa, other than British	51	37	26
Australia, New Zealand and Pacific Islands	120	124	125
Austria, Hungary, Czechoslovakia, etc. ...	37	32	49
Canada	102	102	85
Central and South America	105	118	107
Denmark	7	7	2
East Indies and the Far East	116	112	101
France	216	216	236
Federated Malay States	19	8	10
Germany	161	175	292
Great Britain	269	246	272
Hawaii	22	12	21
Holland, Belgium and Luxemburg	47	55	33
India and Ceylon	103	114	95
Iraq	1	1	4
Italy	81	58	57
Malta and Cyprus	4	—	4
Palestine	4	8	2
Russia, Finland, Estonia, etc....	93	113	189
Scanidinavia	8	11	14
Spain, Portugal and Colonies	39	18	7
Switzerland	15	20	27
United States of America	693	740	588
West Indies	46	38	37
	2,439	2,471	2,514

(K2837) Wt P 7/D 23 1,500 1/26 H & SP Gp 52

The system under which a given part contains abstracts of all papers received by the Bureau up to within some eight weeks of the date of publication, which was inaugurated in 1916, has not only been maintained during the ten years that have elapsed, but has been slightly improved. Thus, the present part, published in January 1926, contains all the matter received up to the 10th December 1925.

Authors are reminded that they can co-operate in making the *Review* even more up-to-date by sending separates of their papers immediately on publication, especially when they appear in obscure or non-entomological journals.

It has been thought advisable to make some change in the titles of papers published in Russian and allied languages, and the following system will henceforward be used in the *Review* in connection with titles originally appearing in Slavonic alphabets.

The name of the author transliterated in [ ] will be followed by his name in Slavonic characters.

An English translation only of the title will be given, followed by a note in [ ] indicating the language in which the original is published.

The reference to the journal will be given in transliterated form, followed where necessary by a translation in [ ], except where an alternative title in a language other than Russian, etc., is printed on the original, *e.g.*

> [YACHEVSKĪĬ (A.).] **Ячевский (А.).** The Question of Uniting Entomo-Phytopathological Work by means of Central Institutions. [*In Russian.*]—Byulleten’ 2-go Vserossīĭskogo Éntomo-Fītopatologīcheskogo Sʻezda v Petrograde 25–30 Oktyabrya 1920 g. [*Bull. 2nd All-Russian Entomo-Phytopath. Meeting*], no. 3, pp. 2–6. Petrograd, 27th October 1920.

In the event of an author who is known to have published papers in Slavonic, also publishing in other languages and using a transliteration for his name different from that adopted in the *Review*, his name will be given as in the original preceded by the *Review* transliteration in [ ], *e.g.* [Yachevskīĭ (A.).] Jaczewski (A.).

The system of transliteration is based on that used in the British Museum, and is as follows :—

А — a	**Ј** — i	**О** — o	**У** — u
Б — b	**И** — ī	**Ѵ** — œ	**Ы** — ui
Ћ — ć	**Й** — ĭ	**П** — p	**В** — v
Ч — ch	**Џ** — j	**Р** — r	**Я** — ya
Д — d	**К** — k	**С** — s	**Ѣ** — ye
Е — e	**Х** — kh	**Ш** — sh	**Ю** — yu
Э *or* **Є** — é	**Л** — l	**Щ** — shch	**З** — z
Ф — f	**Љ** — l’	**Т** — t	**Ж** — zh
Ђ — g’	**М** — m	**Ѳ** — th	**Ъ** — ‘
Г — g *or* h	**Н** — n	**Ц** — tz	**Ь** — ’
І — i	**Њ** — n’		

Kannan (K. K.). **A Serious Pest of Cardamoms.**—*Mysore Agric. Calendar, 1925*, pp. 32, 33, 36. Bangalore, 1925.

This paper has already been noticed from another source [*R.A.E.*, A, xiii, 72].

Kuwana (I.). **The Diaspine Coccidae of Japan, II. The Genus** *Lepidosaphes*.—*Imp. Plant Quarantine Serv.*, Tech. Bull. 2, 42 pp., 11 pls. Yokohama, September 1925.

This paper contains descriptions of 23 species of *Lepidosaphes* recorded from Japan, with a key to them. The following new species are described: *L. kamakurensis* on leaves of *Camellia japonica*; *L. yanagicola* on willow; *L. kuwacola* on *Morus alba* (mulberry) and other plants; *L. ume* on *Prunus mume*; *L. cymbidicola* on orchids; *L. celtis* on *Celtis sinensis* var. *japonica*; and *L. okitsuensis* on *Abies firma*.

Harukawa (C.). **Studies on the Rush Saw-fly,** *Tomostethus juncivorus*, **Rohwer.**—*Ber. Ohāra Inst. landw. Forschungen*, ii, no. 5, pp. 521–545, 2 pls. Kuraschiki, 1925.

The larvae of *Tomostethus juncivorus*, Rohw. (rush sawfly) cause considerable damage in Okayama Prefecture to rushes, *Juncus effusus* var. *decipiens*, grown for making mats. A preliminary report on this insect has already been noticed [*R.A.E.*, A, viii, 144], but the life-history, as now known, differs in various details from that previously recorded.

There are two generations a year; the adults of the first appear from about the end of April to 10th June; those of the second from about the middle of September to 10th October. The females of the two generations differ somewhat in colouration; they begin ovipositing shortly after emergence, without flying far, each laying about 100 eggs. The eggs are laid singly in the leaves just below the green tissues; they hatch in about 15 days in the spring, and in about 12 days in the autumn. Parthenogenesis occurs, the eggs laid by unfertilised females always producing males. The average growing period of the larvae of the first generation is 36 days, during which time they moult 4 times; usually for the first 3 stages, lasting about 12 days, they mine the leaves, after which they feed on the green tissues externally; shortly after the last moult the larvae crawl to a drier place, usually the raised boundary of the field, to make their cocoons, in which they aestivate, pupating at the beginning of September; the period passed by the larvae and pupae in the cocoons during the summer is about 3 months. The average growing period for the larvae of the second generation is 43 days; they make their cocoons in November, hibernate in them, and pupate in the spring. The cocoons are usually about ¾ in. below the soil; it was found experimentally that the hibernating larvae are unable to withstand freezing and thawing in a wet soil. The unirrigated rush nurseries are especially favourable to the development of the sawfly, and they are probably the chief means of spreading it to new fields, as the adults, particularly the females, do not fly far.

The most successful measures against the larvae were the following dusts and sprays: 1 part (by weight) pyrethrum powder and 150–200 parts wood ash, thoroughly mixed and ground together; 1 part (by weight) tobacco dust and 20 parts wood ash; an emulsion of kerosene, 2 gals., extract of pyrethrum, 10 oz., soap, 8 oz., and water, 1 gal., diluted with 29 parts water ; a commercial lead arsenate paste (3 lb. to 40 gals. water) ; and a proprietary solution of derris, diluted with 1,000–2,000 times its volume of water. All the above insecticides killed 90–100 per cent. of the larvae, while the last-named, diluted with 1,000 parts either pure water or soap solution, invariably killed 100 per cent. Experiments in placing larvae on water covered with a thin film of kerosene were not very satisfactory. Incidentally, it was found that the toxicity of the kerosene decreases after standing for about 30 minutes. The adult sawflies, which are sluggish, should be captured with a net in the rush nurseries. The weeds on the boundaries of the fields should be mowed, and the surface soil removed and submerged to destroy the cocoons. Alternation of the crop with rice every few years is advisable.

HARUKAWA (C.). **Studies on the Oriental Peach Moth,** *Laspeyresia molesta,* **Busck.**—*Ohāra Agric. Res. Inst.,* Spec. Rept. no. 3, pp. 1–157, 2 pls. Kuraschiki, Japan, 1925. Price 2 *Yen.* (In Japanese.)

The first part of this report summarises the results of the observations and experiments carried out by the author on *Cydia* (*Laspeyresia*) *molesta,* Busck, before the end of 1922, and the second part records the results of ecological studies in 1923 and 1924. Many of the important phases in the life-history have already been noticed [*R.A.E.*, A, vii, 108 ; xii, 92]. The habits of the moth are normal when the peach and sand pear [*Pyrus sinensis*] are present in the same locality. Where food-plants other than *P. sinensis* are very scarce, the larva begins to attack young and unripe sand pears early in the summer. The moth thrives as well in an orchard where only *P. sinensis* is grown as in those where pear, peach or cherry are found together. It was thought that later ripening varieties of sand pear were the more severely attacked, but in the author's opinion some of the early ones are also affected.

The development of the moth is greatly influenced by air temperature. The number of generations may vary considerably even among individuals in the same year, and from 4 to 6 complete generations have been observed. The completion of one generation takes 44·1 days on an average at a mean daily temperature of 18·2° C. [64·4° F.], and proportionately less at higher temperatures.

This insect is fairly resistant to drought. A relative humidity of 10 per cent. arrests the development of about 50 per cent. of the eggs and pupae ; a humidity of 35 per cent. has a slight effect on the development. The larvae are very resistant to cold and a low temperature, –7 to –9° C. [19·4–15·8° F.] for 2 or 3 hours did not kill all the individuals exposed to it. The adult is slightly attracted to light, especially to blue or green rays. Hibernation comes about as a result of low temperature, though this is not the only cause.

YOKOYAMA (K.). **List of Insects injurious to Mulberry and** *Bombyx mori* **in Japan.**—*Insect World,* xxix, nos. 6–9, pp. 187–195, 227–233, 265–270, 296–301. Gifu, Japan, June–September, 1925. (In Japanese.)

About 170 insects are known to be injurious to mulberry in Japan ; 11 are parasitic or prey upon the larvae of the silkworm, *Bombyx mori,* and 17 are injurious to the eggs, cocoons and silk. A list is given of these species, with brief biological notes on some of them.

GONZALES (S. S.). **The Sweet Potato Weevil** (*Cylas formicarius*, **Fabr.**). —*Philipp. Agriculturist*, xiv, no. 5, pp. 257–281, 3 pls. Los Baños, October 1925.

Cylas formicarius, F., is one of the most serious pests of sweet potatoes (*Ipomoea batatas*) in the Philippines.

Investigations on control methods applicable to Philippine conditions were carried on from April 1923 to February 1925. The methods employed for rearing and observing the different stages of the weevil are described.

There is no regularity in the number of eggs laid daily; only one is deposited in each hole in the root, the average laid by each individual being 256. They hatch in from 6 to 9 days with an average of 7·65 days in the rainy season and 6·15 in the dry. The larvae immediately eat their way deep into the tissues of the root, the tunnel becoming wider as the larva develops, and the interior of the root becoming tunnelled in all directions. Pupation occurs in the root in a relatively large cavity at the end of the larval tunnel. Pupae removed from the cavity produced weak adults, most of which died soon after emergence. The pupal period varies from 4 to 6 days. The newly-emerged adults remain in the tunnels in the roots for some time. The adult stage varies from 63 to 120 days. Though the work was not extensive enough to warrant very definite conclusions, there are apparently nine consecutive generations a year. The seasons of the year, at least in the Philippines, have no appreciable effect on the intensity of infestation. The parasites, *Microbracon cylasovorus*, Rohw., and *Bassus cylasovorus*, Rohw., are apparently not of any great value in checking the pest.

So far no particular variety of sweet potato has been found to show any relative immunity from attack, but as no other field crops are known to be attacked by *C. formicarius*, crop rotation should prove successful in reducing the pest. The proper disposal of the sweet potato roots and stems after each harvest will help to starve the weevils out. Only the more succulent tops, which are apparently never attacked by this pest, should be used for propagating purposes.

Fumigation with carbon bisulphide has been tried for the control of *C. formicarius* in stored sweet-potatoes, but although all the adults on the outside of the tubers were killed, the larvae in the burrows remained unaffected.

SHIPLEY (Sir A. E.). **Enemies of Books.**—*Trop. Agriculture*, ii, nos. 10 & 11, pp. 223–224 & 244–246, 1 fig. St. Augustine, Trinidad, October & November 1925.

This paper summarises the information respecting the insects that infest books in various parts of the world, more especially in the tropics. Control measures include painting the insides of the covers with a solution of mercury bichloride in spirits of wine every five or six years, and, where possible, book-binders should be recommended to mix mercury bichloride with the paste used. A mixture of 100 cc. of methylated spirits, 20 gr. of mercury bichloride and 15 cc. carbolic acid, with sufficient shellac to cause adhesion, lightly brushed over the book covers is used against termites. A formula that was successful in preventing the ravages of insects in books in China consisted of an alcoholic solution containing 2 per cent. mercury bichloride and ½ per cent. creosote.

With regard to books and papers already infested, evidence is in favour of fumigating with carbon bisulphide, which volatilises spontaneously at ordinary temperatures. Naphthalene is recommended as a general protection for stored books and papers. A special creosote bottle for use in storage boxes is described.

MERCET (R. G.). **Encyrtides et Aphelinides d'Egypte (Hyménopt. Chalcid.).**—*Bull. Soc. R. ent. Egypte*, xviii, pt. 1–3, pp. 46–55, 2 figs. Cairo, 1925.

The species dealt with include *Trichomasthus tenuicornis*, sp. n., and *Anicetus* (*Paracerapterocerus*) *africanus*, Gir., bred from *Ceroplastes africanus*, Green.

DELASSUS (—). **La lutte contre le *Liparis dispar* dans le massif de l'Edough.**—*Rev. agric. Afr. N.*, xxiii, nos. 327–328, pp. 334–336 & 348–352, 9 figs. Algiers, 6th & 13th November 1925.

The outbreak of *Porthetria* (*Liparis*) *dispar*, L. (gipsy moth) [*R.A.E.*, A, xi, 479], which covered an area of nearly 750 acres, has now extended to almost 7,500 acres, and is only about half a mile distant from the nearest fruit-growing districts. Owing to the extent of the infestation and the local conditions, little can be expected from the usual measures, such as banding and spraying, though they should be carried out where possible. During May and June 1925 various insect enemies were imported from Spain; these are *Xylodrepa quadripunctata*, *Calosoma inquisitor*, *C. sycophanta* and *Apanteles solitarius*. The last two apparently already occur in Algeria, though the activities of *C. sycophanta* are greatly reduced, as it is itself destroyed in large numbers by foxes. It is believed that the activities of indigenous and imported enemies of *P. dispar*, combined with auxiliary measures, such as the use of light-traps to capture the adults, should in time prevent this pest from becoming a serious menace to fruit-growing in Algeria.

POUTIERS (R.). **Traitement contre le Pou Rouge de l'Oranger.**—*Rev. hortic. Algérie*, xxix, no. 10, pp. 184–186. Algiers, October 1925.

The author discusses the preparation of an oil emulsion that has previously been dealt with at greater length [*R.A.E.*, A, xiii, 296].

VAYSSIÈRE (P.) & MIMEUR (J.). **Sur quelques insectes nuisibles au cotonnier en Afrique occidentale française.**—*Agron. colon.*, no. 93, pp. 89–125, 7 pls. Paris, September 1925.

Among the pests of cotton in French West Africa are the termite, *Microtermes* (*Ancistrotermes*) *soudanensis*, Sjöst.(MS.), which does not construct termitaria, but works in young cotton stems. It makes an oval orifice at about the height of the collar and then mines downwards and upwards constructing a central gallery occupying generally the whole interior of the stem and sometimes 3 cm. long. The plant wilts and dies almost at once. Closer sowing of the cotton seed reduces the damage to a certain extent.

The Buprestid, *Sphenoptera gossypii*, Cotes, oviposits in the fissures of the bark at the base of the stems, depositing generally a single egg or a group of about six. The young larvae tunnel up and down, filling the galleries with excrement and fine dust. From September to February tunnelling takes place chiefly in the roots, while from March to July the larvae work mostly from 8 to 20 inches up the stem. Pupation occurs in an oval chamber under the bark, which is pierced by the adult in emerging after about 30 days. The total life-cycle occupies 6 or 7 months, and there are generally two generations in a year. The maximum oviposition occurs in May and June, though all stages are found throughout the year. The injury depends largely on the form of the gallery and the age of the plant, which may continue to grow slowly or may wither and die. Native cottons are resistant to stem miners, only the young ones being killed, but imported ones, particularly American varieties, are very susceptible. The biology of *S. gossypii* on *Vigna catjang* is described. The roots of this plant, when left in the ground, or pulled up late and thrown aside as rubbish, are capable of harbouring the beetle, as also are perennial cottons and *Hibiscus rosasinensis.* The only parasite of *S. gossypii* known is the Braconid, *Pseudovipio andrieui*, Vuil., which occurs in the French Sudan and in Senegal ; it is, however, scarce in both colonies and is very little check on the Buprestid. The remedies suggested are the destruction of infested cotton and other food-plants, and the cultivation of annual in place of biennial cottons, which are always far more heavily infested. Cutting back the plant is useless as a check to development of the pest, which, during hibernation and in the dry, cold season, is found almost entirely on the underground parts of the plant. The roots of cotton plants should be pulled up and burnt immediately after the crop is gathered, unless the parts containing parasites are kept in order to liberate them. A cotton crop should not be immediately preceded by a crop of *Vigna* or of *Dolichos* spp. Two other beetles, *Zophosis longula*, Fairm., and *Hyperops* sp., have been found in galleries originally constructed by *S. gossypii.*

Adults of the Meloid, *Mylabris affinis*, Oliv., devour the petals and stamens of cotton flowers and sometimes enter the buds ; they apparently cause very little damage, however, and may assist in fertilisation. The larvae of the Tenebrionid, *Tenebrio guineensis*, F., attack cotton seeds in the ground, but are negligible as pests. Two Curculionids found are *Myllocerus hirtipennis*, Hustache, sometimes numerous on the buds, shoots and young leaves, and sometimes accompanied by another species of *Myllocerus*, though no damage has been known to result from them ; and *Alcides gossypii*, Hustache, which is rather numerous after the rains, between the bracts and the capsules, though it is not known to be a pest. The Chrysomelids, *Nisotra uniformis*, Jac., and *N. dilecta*, Dahl., are frequently found on the lower surface of the leaves of young plants, where they destroy the parenchyma. Oviposition occurs in the soil, and the larvae, which are very active, feed on the roots. When very abundant, these pests may kill the young cotton plants, so that fresh sowing is necessary. Arsenical sprays are recommended against these beetles.

The Lasiocampid, *Chilena obliquata*, Klug, has been observed in very small numbers, the larvae attacking the leaves. *Diparopsis castanea*, Hmps. (red bollworm) has only been observed on cotton. The young larvae enter a bud or capsule and attack the ovary or the forming seeds, frequently destroying the entire fruit, which may then fall to the ground, carrying the larva, which pupates in the soil. The egg stage generally occupies from 2 to 6 days, and the larval from 23 to 38 days, while the pupal period varies according to the season and may occupy from 12 days to several months. The number of generations in a year is not known. Each larva is capable of attacking several capsules in turn. No parasite of this pest is known in the French Sudan. The infested capsules should be gathered and burned as soon as they are observed, and hoeing during the growing period will destroy many pupae. After the crop is gathered, the ground should be dug deeply to destroy the remaining pupae. This should be followed by harrowing and rolling, that is, by the ordinary processes of dry farming. Arsenical sprays, where possible, as used in the United States against *Alabama argillacea*, Hb., will give good results. *Prodenia litura*, F., has many food-plants in French West Africa, and attacks in particular the parenchyma of the cotton leaf. The larval stage lasts about 20 days in summer, and the pupal stage 7 to 40 days in favourable weather and much longer in the cold season ; the number of generations a year in French West Africa is unknown, though in Egypt there are about seven. In 1922–23 the moths appeared only in small numbers and caused minor damage. The remedies suggested include open sowing ; avoidance of successive susceptible crops ; hand-picking of the egg-masses and larvae ; the use of arsenicals in case of heavy infestations, and of light traps ; and the importation of natural enemies and protection of insectivorous birds. *Xanthodes intercepta*, Guen., only found on cotton by the authors, feeds during the day on both surfaces of the leaves, but is never very numerous. *Cosmophila flava*, F., feeds on all species of *Gossypium* and various species of *Hibiscus*, especially *H. esculentus*. Oviposition occurs on the leaves, and after 3–6 days the larvae hatch and feed on the edges of the leaves, pupating after 12 to 16 days in the ground or in a rolled leaf. This moth is never very abundant and does not cause serious damage. The Arctiid, *Diacrisia punctulata*, Wallg. [? *investigatorum*, Karsch], is present in small numbers and is not an important pest. The Tineid, *Acrocercops bifasciata*, Wlsm., attacks cotton plants in the cotyledon stage and feeds on the parenchyma ; the remedies suggested are the destruction of species of *Terminalia* (the alternative food-plant) and the collection and burning of infested leaves. *Pyroderces simplex*, Wlsm., oviposits on the green capsules and sometimes on the ripe fruit, particularly after attack by *Earias*. The larva cuts the fibres and hollows out the seed, where it pupates, hibernation occurring in the larval stage. The recommendations are to collect and burn capsules containing larvae as soon as the crop is gathered, and to burn all débris of cotton, millet, maize, etc. The Pyralid, *Corcyra cephalonica*, Staint., attacks stored goods, including cotton seed. The female deposits from 120 to 160 eggs in 3 or 4 days, on the seeds or on the walls around. In spring the total life (from oviposition to death) lasted from 46 to 72 days. The Braconid, *Habrobracon brevicornis*, Wesm., is an important parasite of this Pyralid, its life-cycle requiring in April, from egg to egg, from 13 to 16 days. Remedies suggested are stirring and collection of the infested seeds as is usually practised against weevils. It is said that a prolonged exposure of the seed to a temperature of 122° to 131° F. will kill *C. cephalonica*, but some seeds cannot withstand this temperature. Thorough disinfection of all storage places should be practised before they are used again.

In an appendix, a note is given on *Platyedra* (*Gelechia*) *gossypiella*, Saund. (pink bollworm), with the adult and larval characters distinguishing it from the moths with which it may be confused. The present distribution of *P. gossypiella* is discussed. It does not yet occur in French West Africa. Experiments have shown that besides the standard methods of treating cotton seed by fumigation or heat practised in America and elsewhere, treatment with chloropicrin, as tested and used in France, is an effective measure. In these tests, 181 sacks were treated in four batches, in a room approximately 20 ft. by 14 ft. and 16 ft. high, all crevices being previously closed with strips of paper. The sacks were spread on the floor, each receiving a dose of chloropicrin and were then covered with a tarpaulin. It was found that 18 to 20 gms. of chloropicrin per sack killed all insects in the sacks without affecting the germination of the seed.

VAYSSIÈRE (P.) & MIMEUR (J.). **Dix insectes nuisibles aux cultures de l'Afrique occidentale française.**—*Agron. colon.*, no. 94, pp. 166–190, 8 pp. refs. Paris, October 1925.

The extensive bibliography here included applies also to the various papers on cotton pests in French West Africa by these authors, which have been noticed from time to time in this *Review*.

The present part deals with the following insect pests: the Curculionids, *Apion* (*Piezotrachelus*) *illex*, Faust, widely distributed in Senegal on *Vigna catjang*, and controlled by collecting the adults and the infested fruit, and *Siderodactylus sagittarius*, Oliv., on *Pennisetum spicatum*; the Noctuids, *Selepa docilis*, Butl., on the leaves of groundnuts [*Arachis hypogaea*], *Sesamia vuteria*, Stoll, on sugar-cane, maize and *Sorghum*, particularly on the latter in Senegal and the Sudan, which may be controlled by crop rotation, trap crops of maize, and burning and cutting down infested stalks, and *Cirphis loreyi*, Dup., damaging the ears of *Sorghum* and maize; the Pyralid, *Eldana saccharina*, Wlk., infesting various cultivated graminaceous crops, which may be controlled by cutting and burning the attacked stalks; *Plutella maculipennis*, Curt., a serious pest of cruciferous plants; and the Coccids, *Pseudococcus bromeliae*, Bch., on groundnuts in Senegal, *Aspidoproctus mimeuri*, Vayss., on *Tamarindus indica* at Dakar, and *Ceronema africana*, Macf., on *Poinciana regia*.

COTTERELL (G. S.). **Report of the Entomological Division.**—*Gold Coast: Rept. Agric. Dept. 1924–25*, pp. 34–36. Accra, 1925.

A corn borer, *Sesamia* sp., has been causing serious injury to maize, as many as 70 per cent. of the plants being ruined in some districts. The species of *Oryctes* attacking *Borassus* palms [*R.A.E.*, A, xiii, 110] has been found also to infest coconuts. *O. monoceros* was also recorded on coconuts. The damage to oil palms [*Elaeis guineënsis*] due to *Coelaenomenodera elaeidis* (oil-palm leaf-miner) is the result of the larvae mining in the leaflets and the adults eating the lower epidermis of them.

The following are recorded as attacking cotton in the Mandated Area of British Togoland: *Sylepta* sp. (cotton leaf roller), which is a minor pest and is heavily parasitised; *Aphis gossypii*, which becomes a serious pest during the dry weather, but disappears with the rains; *Earias* spp., common early in the season; *Helopeltis*, only a pest at the beginning of the season, and disappearing entirely at the end of the rains ; *Dysdercus* spp., which are pests of major importance, accounting for 40–50 per cent. of the potential yield in some parts ; and *Oxycarenus* sp., which does not cause staining, but possibly affects the vitality of the seed.

Mallodon downesi is recorded for the first time on rubber, and in some cases young trees were killed by this Longicorn beetle. An outbreak of *Hypsa undulifera* on *Ficus* sp. was controlled by lead arsenate sprays and soil fumigation with paradichlorobenzene where the caterpillars were pupating.

MAYNÉ (R.). **Quelques insectes xylophages ennemis des cacoyers, au Congo Belge.**—*Bull. Cercle zool. congolais*, pp. [87]–[95], 8 figs., in *Rev. zool. afr.*, xiii, pt. 2. Brussels, 30th September 1925.

The larger wood-boring Coleoptera and Lepidoptera infesting cacao in the Belgian Congo are discussed. Of the Cerambycids, *Tragocephala anselli*, Bates, is one of the most serious pests. The eggs are laid on the trunk, and the larvae bore through to the wood. The injury caused depends to a great extent on the diameter of the stem attacked ; it may result in the crown being blown down by the wind or the parts above the point of attack drying up. Pupation takes place in the larval galleries. The exit hole for the adult is made by the larva, and various other holes are also made by it, serving for the ventilation of the galleries and the throwing out of frass. The adults appear from December to February and destroy the bark on the branches of the young cacao plants. This beetle is widely distributed in the forests, where it probably occurs on indigenous trees. *T. maynei*, Gahan, is equally injurious but less abundant ; both this species and *T. buqueti*, Thm., appear to have somewhat similar habits. *Moecha adusta*, Har., may bore in the branches, causing the tips to wither, but the author does not consider it to be a very serious pest ; it apparently prefers recently felled plants or diseased branches. The Bostrychid, *Apate monacha*, L., is widely distributed ; it is mainly a pest of coffee, but may attack cacao, the damage being done by the adults. The larvae live in dead or dying wood. Of the 3 weevils recorded on cacao, *Alcides aschanticus*, Fst., *A. theobromae*, Mshl., and *A. erroneus*, Thoms., the last is the most abundant. The larval galleries generally occur in the young branches, and may result in the death of the parts above the point of attack. The larvae of the Engyophlebid moth, *Engyophlebus obesus*, Karsch (*Eulophonotus myrmeleon*, Feld.) bore in the trunk or main branches of cacao.

MARSH (R. W.). **An Investigation of a Sample of Diseased Seed-cotton sent from Nyasaland.**—*Jl. Textile Inst.*, xvi, no. 10, reprint, 8 pp., 6 figs. [Manchester] 1925.

In Nyasaland the yellow staining of cotton lint is constantly associated with the presence of cotton-stainers, principally *Dysdercus* spp. A number of fungi and two species of bacteria have been isolated from the diseased cotton. The injury is provisionally ascribed to *Nematospora* sp., and will probably prove to be of the same type as the internal boll disease of the West Indies.

D'Emmerez de Charmoy (D.) & Moutia (A.). **Hints on the General Treatment of Insect Pests in Mauritius.**—*Dept. Agric. Mauritius*, Gen. Ser., Bull. 31, 16 pp., 1 fig. Port Louis, 1925.

This is a summary of information on the methods of controlling various types of insect pests, particularly of field and garden crops. Formulae are given for some of the common insecticides, with directions for their application.

Jack (R. W.). **Notes from the Entomological Laboratory.**—*Rhodesia Agric. Jl.*, xxii, no. 8, pp. 852–855. Salisbury, November 1925.

Aphis tavaresi, Del Guer. (black citrus aphis) has occurred in unusual abundance in S. Rhodesia. Observations indicate the importance of having a spraying outfit with which the work in citrus groves may be done in a reasonably short time. All trees should be treated within about 2 weeks. The Aphids are easily killed with nicotine sprays. Coinciding with this outbreak, *Heliothis* (*Chloridea*) *obsoleta*, F., occurred in great numbers, the larvae attacking the newly set and mature fruit. As arsenicals cannot be used on *Citrus* [*cf. R.A.E.*, A, xiii, 614], handpicking the larvae had to be resorted to, but was not very efficacious. A combined spray of 1 gal. lime-sulphur, 9 oz. 40 per cent. nicotine sulphate, 7 oz. universal spreader and 100 gals. water, applied primarily against Aphids and thrips, apparently had some effect in controlling the caterpillars, but further investigations in this connection are necessary. The brood attacking oranges appeared unusually early, the adults being on the wing early in September. This was possibly due to the excessive rains of the previous season, and such outbreaks may therefore be exceptional.

Departmental Activities. Entomology.—*Jl. Dept. Agric. Union S. Afr.*, xi, no. 5, pp. 380–381, 384–385. Pretoria, November 1925.

The peach Aphids, *Anuraphis persicae-niger* and *Myzus persicae*, were troublesome in September over a very wide area, the outbreaks being of a scattered nature. An outbreak of *Bagrada hilaris* was reported on wheat in Griqualand West. The larva of a species of *Pyroderces* on cotton, provisionally regarded as *P. simplex*, has given rise to a certain amount of alarm, owing to its superficial resemblance to *Platyedra gossypiella* (pink bollworm); it does not, however, appear to be responsible for any primary damage and is regarded as a scavenger. *Wohlfahrtia euvittata* has been found to attack all stages of locusts, including the eggs. In some districts as many as 10 to 15 per cent. of the eggs are destroyed; in others the effect is practically negligible, though the fly is present. In some districts Jassids were recorded as injuring wheat, several of the grass-infesting species being implicated. Growers are reminded to use the following bait-spray in order to prevent infestation by fruit-flies: 3 oz. lead arsenate paste, 2½ lb. cheap sugar, ½ gal. unrefined treacle, 4 gals. water. The method of application is described [*cf. R.A.E.*, A, i, 195].

Chevalier (A.). **Une variété améliorée du Cotonnier du Cambodge non attaquée par les Jassides.**—*Rev. Bot. appl. & Agric. colon.*, v, Bull. 50, pp. 775–777. Paris, 31st October 1925.

The information in this paper concerning an Indian variety of cotton resistant to *Empoasca* (*Chlorita*) *facialis* and its possible importance in South Africa has been previously noticed [*R.A.E.*, A, xi, 528; xiii, 393].

TALBERT (T. J.). **Fire Blight of Apples and Pears.**—*Missouri Agric. Expt. Sta.*, Circ. 137, 8 pp., 6 figs. Columbia, Mo., July 1925. [Recd. November 1925.]

Fire blight, which is one of the most serious diseases of apples and pears, may be transmitted by various insects, of which those capable of sucking the plant juices are probably the most important, though mechanical transmission may also occur. Apart from the injury done by insects such as fruit-tree borers, Aphids, leafhoppers, etc., their connection with fire blight is in itself sufficient reason for their control.

BAERG (W. J.). **Control Measures for Blister Beetles.**—*Arkansas Agric. Expt. Sta.*, Bull. 201, 8 pp., 4 figs., 7 refs. Fayetteville, Ark., October 1925.

The blister-beetles that commonly attack garden and field crops in Arkansas, are *Epicauta lemniscata*, F., *Macrobasis unicolor*, Kirby, *E. marginata*, F., and *E. funebris*, Horn. They are not entirely injurious, as the larvae feed on grasshopper eggs ; this is, however, outweighed by the injury caused by the adults to various crops. As they generally congregate in large numbers, dusts are easily applied against them. A mixture of sodium fluosilicate and hydrated lime in equal parts destroyed all the beetles within 48 hours. This dust caused no appreciable injury to soy beans [*Glycine hispida*] and lucerne, and may also be safely used on tomatos and potatoes, though clematis vines were severely scorched. Calcium fluosilicate is also on the market as a compound consisting of 15 per cent. calcium fluosilicate and 85 per cent. inert material ; this should be applied without hydrated lime.

BAERG (W. J.). **The Strawberry Weevil.**—*Arkansas Agric. Expt. Sta.*, Circ. 50, 7 pp., 3 figs. Fayetteville, Ark., June 1924. [Recd. December 1925.]

This information concerning the life-history and control of the strawberry weevil [*Anthonomus signatus*, Say] has already been noticed [*R.A.E.*, A, xi, 410]. The importance of selecting resistant varieties adapted to the locality for which they are intended is emphasised.

DOOLITTLE (S. P.) & WALKER (M. N.). **Further Studies on the Overwintering and Dissemination of Cucurbit Mosaic.**—*Jl. Agric. Res.*, xxxi, no. 1, pp. 1–58, 6 pls., 19 refs. Washington, D.C., 1st July 1925. [Recd. November 1925.]

Some of the more important information contained in this paper has already been noticed from another source [*R.A.E.*, A, xiii, 274]. The insects that transmit mosaic disease of the cultivated cucumber, *Aphis gossypii*, Glov. (cucumber aphis), *Diabrotica vittata*, F. (striped cucumber beetle), and *D. duodecimpunctata*, Oliv. (twelve-spotted cucumber beetle) [*R.A.E.*, A, ix, 306] also transmit the disease from *Micrampelis lobata* (wild cucumber) to cultivated Cucurbitaceae. From this point of view *D. vittata* is of greater importance than the other insects, as the adults emerge from hibernation at the time when the seedlings of *Micrampelis lobata* appear, and subsequently migrate to the cultivated species, infecting them with mosaic, which is transmitted to the young *Micrampelis* through the seeds. *D. duodecimpunctata* and *A. gossypii* do not usually appear in numbers on

Micrampelis until the cultivated cucumbers are already infected. By destroying all *Micrampelis* plants except a single group, from a particular area, it was found that *D. vittata* transmitted mosaic disease to healthy cucumbers over distances up to 500 yards. It is probable that although the beetles may fly further [*R.A.E.*, A, xi, 485], they do not transmit the disease over greater distances. *Micrampelis lobata* occurs throughout the central and eastern United States, and has usually been found to be infected with mosaic disease in the localities where the disease occurs in cultivated plants ; it may therefore be regarded as an important source of infection. In some districts *Asclepias syriaca* (milkweed) in and near cucumber fields has also been found to be an important source of infection ; it is perennial, and the disease is retained by the roots through the winter, but is not transmitted through the seeds. *Diabrotica vittata* and *D. duodecimpunctata* feed less readily on *Asclepias* than on cucumber, and although *D. vittata* has been found capable of transmitting mosaic from it to the cultivated cucumber, *Aphis gossypii* is a much more important agent in this respect. Except in the immediate vicinity of cucumber fields *Asclepias* is rarely found either affected with mosaic disease or infested with *A. gossypii*, which is the only Aphid found on the cucumber. Mosaic disease of *Phytolacca decandra* (pokeweed) has been found to be intertransmissible with that of cucumbers. The plant is perennial, and the disease is retained by the roots through the winter, but is not transmitted through the seeds. In parts of Michigan, Illinois and Indiana it appears to be an important source of infection for cultivated cucumbers. Mosaic is transmitted from *Phytolacca* to cucumbers by *A. gossypii*. *D. vittata* and *D. duodecimpunctata* are not common on *Phytolacca*, and neither has been found to transmit the disease from it to cucumbers. *Nepeta cataria* (catnip) and *Physalis* spp. are other perennial plants in the roots of which cucumber mosaic passes the winter. Among annual plants cucumber mosaic was transmitted experimentally, both by means of *Aphis gossypii* and artificially, to *Martynia louisiana*, *Amaranthus retroflexus* (pigweed), and *Capsicum annuum* ; in each case the disease was re-transmitted to cucumbers by both means. The disease is not transmitted through the seeds of any of these plants, but they may serve as sources of infection to cucumbers in the summer, contracting the disease from the perennial hosts before the removal of the latter. *Capsicum annuum* was found to be susceptible also to tobacco mosaic (inoculated artificially), and through the medium of this plant tobacco mosaic was transmitted to cucumbers (artificially and by means of *A. gossypii*) and cucumber mosaic was transmitted to tobacco (artificially) [*cf. R.A.E.*, A, xiii, 563]. Lists are given of 23 species and 94 horticultural varieties of Cucurbitaceae found susceptible to mosaic transmitted either artificially or by *A. gossypii*. Seven varieties of *Citrullus vulgaris* (water-melon) were found to be immune, but the green-seeded variety was susceptible.

YOTHERS (W. W.) U.S. Bur. Ent., & WINSTON (J. R.). **Preliminary Report on Colloidal Clays as Emulsifiers for Mineral Oils used in Spraying Citrus Groves.**—*Jl. Agric. Res.*, xxxi, no. 1, pp. 59–65. Washington, D.C., 1st July 1925. [Recd. November 1925.]

In the preparation of a spray for use on *Citrus* in Florida from boiled oil emulsion it is necessary either to treat the water with which the emulsion is to be diluted or to use some colloidal substance as a stabiliser [*R.A.E.*, A, xiii, 122]. When an organic substance is employed as a stabiliser and the spray is not used soon after its manufacture, fermentation takes place, and the emulsion breaks down. Tests with inorganic substances as stabilisers included kaolin, which was not, however, satisfactory; these led to the trial of kaolin as an emulsifier in place of soap. The method of making this emulsion has already been noticed [*R.A.E.*, A, xiii, 429]. Fuller's earth, which, like kaolin, consists mainly of hydrated aluminium silicate, was tested in place of kaolin; when used with the same proportions of oil and water as were used with kaolin, the resulting emulsion was much thinner. An emulsion of lubricating oil, 2 U.S. gals., water, 1 U.S. gal., fuller's earth, 2⅔ lb., proved entirely satisfactory. Both the kaolin and the fuller's earth emulsions mixed with hard water from deep wells, and with nearly all spray materials used in citrus groves, including Bordeaux mixture; concentrated sulphuric, nitric, and hydrochloric acids, saturated caustic soda and concentrated lime-sulphur solutions did not cause the oil to separate appreciably. Brick clay, hydrated lime, and various proprietary Bordeaux pastes and powders were also tested as emulsifiers, but were not so good as kaolin or fuller's earth. An emulsion of kaolin, lime-sulphur and oil was made as follows: 2 lb. kaolin were placed in 3 U.S. gals. lime-sulphur solution and allowed to stand 12 hours; 1 U.S. gal. lubricating oil was then added and emulsified with a bucket pump. An excellent emulsion was obtained using 1 lb. fuller's earth in 3 U.S. qts. lime-sulphur solution, adding 3 U.S. qts. oil.

The emulsions were usually diluted to produce a spray containing 1 per cent. oil.

Kaolin emulsions did not at any time cause serious damage to citrus trees, but caused defoliation of wild cherries (*Prunus serotina*) in full growth. Kaolin emulsions were equally harmless to citrus trees in combination with Bordeaux mixture, but when used in combination with lime-sulphur solution caused considerable injury in some cases. When kaolin emulsion and lime-sulphur solution are used separately, there is less likelihood of damage resulting. When fuller's earth emulsion was used, diluted to the required strength, some scorching of foliage occurred, but the addition of 2 lb. hydrated lime to 50 gals. of diluted spray almost eliminated this, and excellent results were obtained. As kaolin and fuller's earth emulsion sprays have the appearance of not spreading well, the addition of calcium caseinate was tried; this gave a smoother spray, which spread more evenly over the leaves and fruit, but on the following day no difference was observed between trees sprayed with it and those sprayed with the ordinary kaolin emulsion spray, and in each case there was an even film of oil.

For making large quantities of kaolin or fuller's earth emulsions 133 lb. of the emulsifier should be added to 50 U.S. gals. water in a tank, and allowed to stand until saturated; 100 U.S. gals. oil should then be added, and the mixture should be pumped twice through the pump of a power spraying outfit. The emulsion may be stored in barrels until required, and will keep indefinitely. Lubricating oil emulsions in which kaolin or fuller's earth is used for the emulsifier are much cheaper, both for material and labour, than those in which caustic-potash fish-oil soap is used; kaolin costs from one-sixth to one-ninth as much as soap, and fuller's earth is still cheaper. The chief objection to these emulsions is that they are a semi-paste rather than a fluid. They are about as effective as the soap emulsions.

ROBINSON (R. H.). **Spreaders for Spray Materials, and the Relation of Surface Tension of Solutions to their Spreading Qualities.**—*Jl. Agric. Res.*, xxxi, no. 1, pp. 71–81, 10 refs. Washington, D.C., 1st July 1925. [Recd. November 1925.]

The fact that spraying against insect pests does not give better results than are at present obtained is considered to be due to the difficulty of covering the entire surface sprayed with a film of poison; consequently, spreaders that would render thorough spraying more easy would be of great value. An ideal spreader should cause the poison to be deposited in a continuous film on the surface covered, instead of collecting in drops; it should increase adherence; it should not react chemically with the poison to form by-products that would cause foliage injury; it should not diminish the toxic properties of the poison; and it should not cost too much. The difficulty of selecting a spreader fulfilling these requirements is increased by the fact that the plants to be sprayed may have several different kinds of surfaces. According to W. A. Ruth and V. W. Kelley (unpublished data) the behaviour of plant surfaces towards sprays changes very rapidly, even in a week or 10 days. A survey of the literature of the subject makes it apparent that any spray solution, to spread well, must have both a low surface tension and a low interfacial tension to the solid or surface sprayed, as the sum of these values must be less than the surface tension of the surface sprayed. The surface tension of numerous substances in solution, determined by an apparatus devised by Fahrenwald, is tabulated, and also the degree of spreading, as determined by spraying leaves and fruits with an atomiser. There is no consistent relation between surface tension values and spreading qualities. It therefore appears that the other variable factor, the interfacial tension between the liquid and the solid, is important. Being unable to determine the interfacial tension between liquid and solid, the author obtained the corresponding values using a liquid, paraffin, in place of the solid. The values thus obtained are tabulated, but the results show no relation between them and the spreading qualities of the various solutions; it is, therefore, concluded that oils cannot be substituted for plant surfaces in calculating the comparative values of the interfacial tensions between the latter and sprays.

In testing the spreading qualities of sprays it was found that they varied considerably with the species of tree sprayed, and even with the age of the leaves. The most satisfactory spreaders tested were soaps and substances containing water-soluble or colloidal proteins. In general a much higher concentration of the soaps than of the proteins was required to produce the same effect. In spraying cabbage leaves it was found that it was not necessary for the spray to be applied with sufficient force to penetrate the waxy covering, as had been supposed by W. Moore [*R.A.E.*, A, x, 424]; the force necessary to form a good film depended on the concentration of the protein, being greater for the lower concentrations than for the higher. This applies also to the waxy covering of apples. The study of soluble proteins as spreaders was extended to other substances of a similar nature, including albumin, pepsin, dried skim milk powder, and hot water extracts of dried blood, of sage, and of various hays, all of which were satisfactory on all surfaces tested, even at low concentrations. The author considers that the success of the seaweed mucilage used by Issleib [*R.A.E.*, A, ii, 335] and Stearns [*R.A.E.*, A, viii, 355] was probably due to the presence of soluble proteins. Except in the case of a severe outbreak of a pest it is uneconomic to use a spreader of which the price is high, such as commercial casein-lime; but if the cost is low enough, the more general use of spreaders is advisable. Considering their low cost, very satisfactory results were obtained with skim milk and dried and condensed skim milk [*R.A.E.*, A, xii, 401]; these solutions are more easily made than those of casein-lime. Experiments with milk and casein-lime as spreaders for lead arsenate sprays showed that the actual amount of lead arsenate deposited was not increased by the use of the spreader, but that it was more evenly distributed. Further experiments with skim milk and casein-lime are needed to determine the amount of spreader required for the best results under varying climatic and other conditions.

GRAHAM (J. J. T.). **Fungicides and Insecticides. A Preliminary Report on the Analysis of Oil Emulsions.**—*Jl. Assoc. Official Agric. Chemists*, viii, no. 4, pp. 333–343. Washington, D.C., 15th May 1925. [Recd. November 1925.]

In view of the increasing use of oil emulsions and miscible oils in large quantities, a study of the methods of analysis of these insecticides has been made. The emulsifying agent generally used is soap, but non-soap emulsions also have been investigated. Four oil emulsions were prepared, two from red engine oil and two from kerosene oil, and the methods of analysis of these, which are described, gave promising results. For the future determination of the water in soaps, it is suggested that the xylene distillation method should be used. In this, 50 gms. is distilled slowly from a copper retort, the distillate being received in a graduated cylinder. The volume of water layer at the bottom is read, and from this the percentage of water is calculated. It is often advisable to add xylene or kerosene to assist in bringing over the water to prevent foaming. Sheep dips containing large quantities of oils heavier than water may be distilled with a mixture of benzene and kerosene to bring the water layer of the distillate to the bottom and give a good meniscus. The sulphonation test on the separated oil in soap-oil emulsions is useful as an indication of the nature of the oil present, the unsulphonated residue being an approximate measure of the saturated petrolic oils. This promises to become a point of great importance in the examination of oil sprays, since there is some indication that saturated and unsaturated hydrocarbons have quite different effects when applied as sprays. In at least one noticeable instance, an oil spray that has been unusually successful in practice in California shows about 95 per cent. of saturated hydrocarbons in the separated oil, while others show as little as 30 per cent.

Attention is also drawn to the fact that the use of calcium carbonate as an absorbent for tobacco extract in the Kissling method for the determination of nicotine causes loss of nicotine by volatilisation, and the substitution of fuller's earth is suggested. It is thought that the silico-tungstic acid method is preferable for nicotine determination.

MARCOVITCH (S.). **Sodium Silicofluoride.**—*Ind. Eng. Chem.*, xvi, p. 1249. Easton, N.Y., 1924. (Abstr. in *Brit. Cotton Indust. Res. Assoc., Summ. Current Lit.*, v, no. 1, p. E.6. Manchester, 22nd January 1925.) [Recd. November 1925.]

Pure sodium silicofluoride has been found to be an efficient insecticide for the cotton boll weevil [*Anthonomus grandis*, Boh.]. In cage tests, all weevils were killed in from 5 to 24 hours. The weevils died even after mere contact with the powder. The advantages of this substance over arsenical compounds are that it is cheaper, that it acts as a contact poison, kills more rapidly and is less poisonous to man. The disadvantage of the commercial product is its density.

Moreira (C.). [*Schistocerca paranensis.*]—*Bol. Minist. Agric., Ind. e Comm.*, xiv (ii), no. 2, pp. 189–190. Rio de Janeiro, August 1925.

The provisions of the Convention of 1913 between Argentina, Uruguay, Paraguay, Bolivia and Brazil, as to the exchange of information regarding the locust, *Schistocerca paranensis*, have been actively carried out by Argentina and Uruguay, the countries more closely concerned. The Convention contemplated a commission for the study of the supposed region of origin in the Bolivian Chaco, but this has not proved practicable. Dr. Moysés Bertoni, of Paraguay, has pointed out that if this region is really the source of the locusts, the actual area involved will only be a part of it, as vast tracts are saltings and extensive forests, both quite unsuitable for oviposition.

Bondar (G.). **Uma terrivel praga da batatinha que está invadindo as culturas de fumo.** [A Terrible Pest of Potatoes that is invading Tobacco Plantations.]—*Chacaras e Quintaes*, xxxii, no. 4, pp. 319–320, 1 fig. S. Paulo, 15th October 1925.

The potato moth, *Phthorimaea operculella*, Zell., now known to occur in Brazil in the State of Bahia on tobacco [*R.A.E.*, A, xiii, 197], is found also on other Solanaceae, such as *Solanum paniculatum.* A survey is necessary to ascertain if it is an imported pest found only in Bahia or whether it is indigenous. On tobacco it is only the leaves that are less than 16 inches from the ground that are attacked, so that the injury is usually unimportant, but severe losses may occur in nurseries, or among young plants newly set out in the field.

La lucha contra la "pulga" o "pulguilla" de las plantaciones de tabaco. [Measures against *Epitrix parvula* in Tobacco Plantations.]—*Argentina Minist. Agric.*, Circ. 510, 3 pp. Buenos Aires, 30th September 1925.

The flea-beetle, *Epitrix parvula*, occurs in all the tobacco zones in Argentina, and causes serious losses in some areas. The larva feeds on the roots, and the adult attacks the leaves. The best remedy is dusting with a mixture of 5 parts by weight of lead arsenate to 1 of Paris green. It is advisable to dust with equal parts of this mixture and of wood ashes, and the application must be made in the morning before the dew evaporates. In districts where dew is scanty a spray containing 10 lb. of this mixture in 300 gals. water may be used. In any case, the insecticide must be applied at the beginning of an attack. Keeping the fields clean is a valuable preventive measure.

Kopp (A.). **La mosaïque de la canne à sucre. Son apparition aux Antilles françaises. Quelques faits nouveaux.**—*Sta. agron. Guadeloupe*, Bull. tech. 1, 16 pp., 1 p. refs. [Pointe-à-Pitre, 1925.]

This paper is a reprint of one already noticed [*R.A.E.*, A, xiii, 530].

Harland (S. C.). **Studies in Cacao. Part I. The Method of Pollination.**—*Ann. App. Biol.*, xii, no. 4, pp. 403–409, 7 refs. Cambridge, November 1925.

The conclusions arrived at in this paper differ somewhat from those recorded by the author in a previous one [*R.A.E.*, A, xiii, 611]. The majority of cacao flowers are never pollinated under Trinidad conditions. Ants and Aphids are present in something under 10 per cent. of the flowers, and of these 35 per cent. are adequately pollinated. It is concluded that these insects were the chief pollinating agents in the district in which the experiments were made.

Storey (H. H.). **The Transmission of Streak Disease of Maize by the Leafhopper** *Balclutha mbila* **Naude.**—*Ann. App. Biol.*, xii, no. 4, pp. 422–439, 3 pls., 10 refs. Cambridge, November 1925.

It has long been recognised that streak disease of maize in South Africa is not transmitted through the seed, but experiments are described by which it has been proved to be transmitted by the Jassid, *Balclutha mbila*, Naude [*R.A.E.*, A, xii, 468 ; xiii, 111]. By enclosing healthy maize plants in wire-gauze cages in a field of maize affected with streak disease it was found that the disease only spread to the plants enclosed by gauze of sufficiently large mesh to admit adults of *B. mbila* ; this insect was found inside all the cages in which the maize had become diseased. Each of 2 males and 10 females of *B. mbila* from diseased maize was placed in a tube on the end of a leaf of a healthy maize plant in an insect-proof greenhouse for periods varying from 5 hours to a week or more. Of the plants on which these insects were placed 46 out of 48 developed streak disease in from 7 to 26 days, all the young leaves that appeared subsequently being diseased. Control plants growing in the same greenhouse remained healthy. One insect lived for 5 months and conveyed the disease to 8 different plants. No insect tested lost its power of infection, even after periods of starvation or periods spent on sugar-cane, which is apparently immune from streak disease of maize. Certain individuals of *B. mbila* collected on diseased maize were, however, found incapable of causing infection. Individuals reared upon healthy maize, even though the progeny of infective parents, were incapable of infecting the plants with streak disease ; but after feeding on a diseased leaf for a week 26 per cent. of the males and 86 per cent. of the females became infective. Negative results attended attempts to transmit the disease by means of *Aphis maidis*, Fitch, the Delphacid, *Peregrinus maidis*, Ashm., and 60 other Jassids and Fulgorids, probably representing over 20 undetermined species, collected on streak-diseased maize or on sugar-cane.

B. mbila was found to be present, although in small numbers, in all the maize fields in Natal where streak disease occurred. During the day the adults rest on the young leaves forming the terminal cone of the plant, where they may be seen at all seasons of the year ; it is not, however, known what other places are frequented by them. Apparently the number present rarely exceeds 1 to every 20 maize plants, but this is considered sufficient to infect a whole field. It is concluded, from the fact that *B. mbila* is apparently the only means of transmitting streak disease of maize, that a specific relation exists between the insect and the disease virus, and that the virus probably has a developmental stage within the insect. Transmission of streak disease of maize to other graminaceous plants has been obtained only irregularly, and is governed by conditions that are not yet understood.

Davidson (J.). **Biological Studies of *Aphis rumicis* Linn. Factors affecting the Infestation of *Vicia faba* with *Aphis rumicis*.**—*Ann. App. Biol.*, xii, no. 4, pp. 472–507, 5 figs., 15 refs. Cambridge, November 1925.

This paper contains the results of investigations, extending over four years, on the effect of various factors, under controlled conditions, on the infestation of broad beans (*Vicia faba*) by *Aphis rumicis*, L. The general principles involved and the results obtained have, however, a wider application to plant-sucking insects in general. The technique employed is fully described.

The following conclusions are taken from the author's summary: Factors that influence the physiological activity of the plant, thereby affecting growth and the nature of the cell-sap, affect also, through the food factor, the progress of the infestation. Temperature influences the developmental period of the Aphids and also the daily production of young. Beans grown in soil treated with complete mineral manures became slightly more heavily infested than those grown in unmanured soil. In unmanured sand low infestation figures were obtained. Beans grown in sand watered with normal culture solution gave higher infestation figures than those grown in soil watered with the same solution. Beans supplied with increased potash indicated increased infestation, while with less potash a decrease was obtained. Beans grown in sand watered with culture solution containing increased magnesium sulphate showed a marked increase in infestation. Reduction of available daylight causes a decrease in infestation, while, in winter, artificial light, in excess of the ordinary daylight, causes an increase in infestation. Reduction of light is probably associated with a decrease in the carbohydrate content of the plant sap and a decrease in young growth. Bean plants 6 weeks older than the controls gave a marked decrease in infestation figures. Beans grown in acid soil and in badly aerated soil did not show any difference in infestation compared with the control series, but owing to low temperature during the reproduction period the results are inconclusive. The relation between the optimum temperature for the growth of the food-plant and that for the development and reproduction of the Aphids is an important consideration.

Cunliffe (N.) & Fryer (J. C. F.). **Studies on *Oscinella frit* Linn. Supplementary Data on the Relation between Varietal Differences of Oat Plants and Susceptibility to Infestation.**—*Ann. App. Biol.*, xii, no. 4, pp. 508–515, 4 refs. Cambridge, November 1925.

In 1924 trials of varieties of oats for susceptibility to attack by *Oscinella frit*, L., were carried out on the same lines as in 1923 [*R.A.E.*, A, xii, 562] in order to find out whether the observed differences in the extent of infestation would be maintained under the different climatic conditions of another year. The only varieties tested in 1924 were the two most and the two least susceptible varieties of the 1923 investigations and three varieties that had not been previously tested. In 1924 conditions were, on the whole, unfavourable to damage by *O. frit*. Of oats sown on 1st April, so far as stem infestation was concerned, the two most resistant varieties maintained their superior qualities, while one of the two least resistant varieties remained so, and the other showed superior resistance over the previous year. Of oats sown on 23rd April (in which sowing alone the additional varieties were included) no significant differences were observed in extent of infestation, thus indicating that time is of the utmost importance in enabling the plant to reach a resistant stage [see next paper], and that varietal differences are of no value in the young stage. The possibility that resistance may be due to a physical factor, such as resistance of cuticle, which may prevent the newly hatched larva from gaining entrance to the stem, is being investigated. Although slight differences were observed in extent of grain infestation in the various varieties, it is considered unlikely that these differences would remain constant, as they are mainly dependent on the history of the crop during the early growing period.

CUNLIFFE (N.), FRYER (J. C. F.) & GIBSON (G. W.). **Studies on *Oscinella frit* Linn. The Correlation between Stage of Growth of Stem and Susceptibility to Infestation.**—*Ann. App. Biol.*, xii, no. 4, pp. 516–526, 1 fig., 4 charts, 3 refs. Cambridge, November 1925.

If a variety of oat resistant to *Oscinella frit*, L., is to be produced deliberately by plant breeding, it is essential to have information concerning the characteristics that are either responsible for, or coincident with, resistance. As considerable constancy has been observed in the time of the maximum abundance of the fly [*R.A.E.*, A, xii, 284; also next paper], it remains to be determined what is the stage in which the oat plant is most susceptible to attack. It is to experiments on the last point that this paper is devoted; these experiments were complementary to those of Fryer and Collin [*R.A.E.*, A, xii, 561]. The stages of the plant are recorded by the extent of leaf formation, which is dependent on time and environment. Oat plants of known history were exposed to the attack of *O. frit* in different stages, being screened from attack before and after the exposure. These plants were compared with unscreened plants of the same stage, to gauge infestation. Control plants, screened throughout their growth showed no infestation, thus proving the efficiency of the screening. The susceptibility of the main stem to attack was found to be most marked during the 2-leaf and 3-leaf stages of growth; in the 4-leaf stage susceptibility decreased, and beyond this stage the shoot seemed to be relatively immune. Plants in the early 1-leaf stage showed a certain degree of immunity, probably owing to their small size. It therefore appears that damage by *O. frit* can be avoided, either by early sowing (as is well known), or by the selection of a variety of oat which passes quickly through all stages of growth previous to the 4-leaf stage.

CUNLIFFE (N.). **Studies on *Oscinella frit* Linn. A Note on the Seasonal Regularity of the Maximum Prevalence Periods of the Fly in the Field.**—*Ann. App. Biol.*, xii, no. 4, pp. 527–528, 1 chart, 1 ref. Cambridge, November 1925.

The periods of maximum prevalence of adults of *Oscinella frit*, L., at Oxford in 1922 and 1923, and at Harpenden in 1924, are given in a chart; the dates are thus shown to have been in remarkably close agreement in the 3 years considered, bearing out the author's previously expressed opinion [*R.A.E.*, A, xii, 284]. The maximum records for the successive generations were on 26th May, 16th July, and 20th August, respectively.

WALTON (C. L.). **Insects attacking Potatoes in North Wales.**—*Ann. App. Biol.*, xii, no. 4, pp. 529–535, 5 refs. Cambridge, November 1925.

The observations here recorded extended over the years 1921 to 1924, and were made principally in Anglesey and Carnarvon. The data were obtained chiefly in view of the importance of insects as transmitters of the virus diseases. Two species of Collembola, *Smynthurus* (*Bourletiella*) *lutea*, Lubbock, and *S.* (*B.*) *hortensis*, Fitch (*pruinosus*, Tullb.), were widely distributed, but nowhere injurious, although an infestation of the former reaching 600 per plant was observed in one place. Two other Collembola were found on potato tubers, *Achorutes purpurescens*, Lubbock, on a diseased tuber, and *Onychiurus* (*Lipura*) *ambulans*, L., chiefly on those damaged by fungous disease; the last-named is abundant, especially in wet seasons, and has caused serious injury to various garden plants in Carnarvonshire.

In the hot summer of 1921 no Aphids were observed on potatoes, but in the three subsequent years increasing numbers were found. Infestation was heaviest in sheltered fields and gardens, especially in walled gardens where early crops were raised and early infestation had occurred from greenhouses or from shrubs on which the Aphids had probably passed the winter. *Macrosiphum solanifolii*, Ashm., is the most abundant Aphid on potatoes in North Wales; in 1923 it was also obtained on roses, and on tomatos and tulips under glass. *Macrosiphum pseudosolani*, Theo., occurred in limited numbers; apterous females were found within the stamens of potato flowers in August, and some were found on the leaves. On 7th March a number of viviparous females and larvae were found on young potato plants from tubers accidentally left in the soil in a field of broccoli; two females also occurred on loganberry shoots in March. *Myzus persicae*, Sulz., is an abundant species, with a wide range of food-plants and has been a serious pest of sprouting potatoes [*R.A.E.*, A, xii, 39]. *Aphis solanina*, Pass., occurred only in small numbers, and no alatae have been seen; it is found in small groups closely applied to veins on the lower surfaces of the leaves. *Aphis rumicis*, L., was found several times in small numbers, generally near mangels, and migrating alatae of *Anuraphis pruni*, Koch, from neighbouring plum trees, were found commonly. Other Rhynchota found on potatoes included *Philaenus spumarius*, L., *Empoasca* (*Chlorita*) spp., *Psyllopsis* sp. (probably *fraxinicola*, Foerst.), *Pseudococcus gahani*, Green [*R.A.E.*, A, xii, 563], *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.), and *C. sexguttatus*, F., none of which were very common. Coleoptera included *Psylliodes affinis*, L., which was local, but sometimes abundant, and caused considerable damage in two places, *Melolontha melolontha*, L. (*vulgaris*, F.), and *Phyllopertha horticola*, L., neither of which caused serious damage, and wireworms.

In an addendum it is stated that in the summer of 1925, which was hot and dry, the number of Aphids found on potatoes was considerably less than in the two previous years, which were wet and sunless. The diminution in numbers was apparently due to the parasitisation of the apterous viviparous females during June, before colonisation could take place. Capsids were more abundant, especially *Calocoris norvegicus*, and several cases of damage to haulm were noted; *C. sexguttatus*, and *Lygus pabulinus*, L., were also present. A few *Anthocoris* were seen, probably feeding on Aphids.

DUFFIELD (C. A. W.). **Nettlehead in Hops.**—*Ann. App. Biol.*, xii, no. 4, pp. 536–543, 2 refs. Cambridge, November 1925.

The disease of hops known as "nettlehead," occurring in Kent, Sussex, and Worcestershire, has hitherto been supposed to be due to the Nematode, *Heterodera schachtii* (beet eelworm). The author has found that two types of disease exist, which he calls "true nettlehead" and "false nettlehead." Examinations of the rootlets of healthy and diseased hops for the presence of the dormant female forms of the Nematode showed that it is frequently present in considerable numbers in both, and that it apparently has no relation to the occurrence of "nettlehead." It was noticed that "true nettlehead" was more in evidence in the year following a severe attack by Aphids, and the author suggests that the disease may be carried by them, and also by the knives used for cutting away the runners in the spring.

FRYER (J. C. F.) & others. **Insect Pests of Crops in England and Wales, 1922-1924.**—*Minist. Agric. & Fisheries*, Misc. Pubns. no. 49, 35 pp., 1 map, 13 refs. London, 1925.

Among the outstanding features of control work during 1922–1924 in the British Isles was the increasing use of carbolineum washes [*R.A.E.*, A, iv, 154; xiii, 485, etc.]. They have been particularly successful in the destruction of the eggs of Aphids and of the apple sucker [*Psylla mali*, Schmid.]. Evidence as to their effect on the eggs of moths is as yet inconclusive, and it is not known whether trees can withstand continued annual applications, and whether manufacturing firms can ensure constancy of composition in their products. The application of insecticides by means of aeroplanes, which has proved very successful in America against the cotton boll weevil [*Anthonomus grandis*, Boh.] does not seem to be well suited to conditions in English orchards on account of the mixed nature of the crops grown, the generally small areas and the unreliable climate, though this method might prove useful if it became necessary to treat a large acreage very promptly. *Byturus tomentosus*, F. (raspberry beetle), which has been a serious menace to the commercial culture of loganberries, is now being largely controlled by lead arsenate sprays [*R.A.E.*, A, xi, 539], while the best remedy for *Anthonomus pomorum*, L. (apple blossom weevil) is trapping the weevils in sacking bands [*R.A.E.*, A, xiii, 61].

Progress has been made in the control of *Eriophyes ribis*, Nal., causing big bud in black currants, by spraying with lime-sulphur [*R.A.E.*, A, viii, 350; xi, 538]. As the use of tarred felt discs against vegetable root flies is not suitable to commercial conditions in England and Wales, other preventives have been discovered [*R.A.E.*, A, x, 49; xi, 126], and the tetrachlorethane type of fumigants is now the recognised remedy for *Trialeurodes* (*Aleurodes*) *vaporariorum*, Westw. (greenhouse whitefly).

Pests that have been intercepted from abroad during the period under review include *Phthorimaea operculella*, Zell. (potato moth), from Malta and the Canary Islands; a species of *Brachycerus*, in snowdrop bulbs from Smyrna; *Bruchus obtectus*, Say, in beans from U.S.A.; and *Ceratitis capitata*, Wied. (Mediterranean fruit-fly) and *Blissus diplopterus*, Dist. (stink bug), in peaches from South Africa. The Chalcid, *Aphelinus mali*, Hald., has been introduced from France to combat the woolly apple aphis [*Eriosoma lanigerum*, Hausm.].

In 1922 unusually extensive outbreaks of the frit fly [*Oscinella frit*, L.] and of the gout fly [*Chlorops taeniopus*, Meig.] occurred on oats and barley respectively, probably on account of weather conditions. From March to early May (before the flies have emerged) these crops, in favourable weather, should have made sufficient growth to render them able to withstand attack; if, however, the growth is retarded, the crops are in their most susceptible stage when the flies emerge. Oviposition is much more active in bright, warm weather than in cold or wet. During 1922 the temperature from March to early May was continually below normal, while from the third week in May to the first week in June, when the maximum emergence of flies might be expected, temperatures were consistently above the average, so that conditions entirely favoured the flies at the expense of the crop.

Fruit-tree caterpillars were unusually abundant in 1923. During May and June the temperatures were abnormally low, and this may have retarded the growth of the foliage, and, while checking the Aphids, would not have much effect on the caterpillars, so that later on the trees would be unable to produce foliage as rapidly as the pests devoured it. Further study of such conditions is requisite in order to determine what correlation exists between weather and outbreaks of pests. Detailed accounts are given of the occurrence of the more important pests of the various crops, as well as of flowers and stored goods.

FOX-WILSON (G.). **The Mining Habit of** *Otiorrhynchus rugifrons* **Larva.** —*Ent. Mo. Mag.*, lxi, pp. 273–276, 1 fig. London, December 1925.

Otiorrhynchus rugifrons, Gyll., was found in 1923 in Kent, mining in the stems and basal leaves of *Saxifraga hostii*. It is not known whether the mining habit of the larva is an established character; it has, however, persisted for three years in the progeny reared from the original mining larvae, with which laboratory experiments were carried out on 12 species of saxifrages. During these experiments the weevil bred parthenogenetically, and no males were found.

BUTLER (E. A.). **An Invasion of** *Halticus saltator* **Geoffr. (Hemiptera).** —*Ent. Mo. Mag.*, lxi, pp. 276–279. London, December 1925.

Halticus saltator, Geoffr., previously recorded from Deal in 1907, has now been reported as occurring in considerable numbers on potatoes at Winchester, and on *Phlox* and French beans near Cambridge. The possibility of fresh introductions being the explanation of the long gap between these records is discussed, but this is not considered probable. This bug is confused in some collections with *H. apterus*, L., and also with *H. rufifrons*, Fall.

Puri (I. M.). **On the Structure of the Larval Stages of** *Leptohylemyia coarctata*, **Fall.**—*Ann. & Mag. Nat. Hist.*, xvi, no. 95, pp. 503–508, 1 pl., 9 refs. London, November 1925.

The structure of the three larval stages of *Leptohylemyia coarctata*, Fall. (wheat bulb fly) is described. Among the larvae reared by F. R. Petherbridge [*R.A.E.*, A, ix, 321] a few first stage larvae differ slightly from the primary larvae of *L. coarctata*, though in most characters they closely resemble the latter species. The points of difference are discussed.

Green (E. E.). **Notes on the Coccidae of Guernsey (Channel Islands), with Descriptions of some new Species.**—*Ann. & Mag. Nat. Hist.*, xvi, no. 95, pp. 516–527, 5 figs. London, November 1925.

This catalogue of the Coccids of Guernsey comprises 30 species, including: *Phenacoccus minutus*, sp. n., on the underground roots and stems of *Erica cinerea*; *Pseudococcus luffi*, Newst., on *Silene maritima* and *Armeria vulgaris*, additional descriptions of the female being given; *P.* (*Trionymus*) *californicus*, Ehrh.; *P.* (*T.*) *dactylis*, sp. n., found beneath the leaf-sheaths of *Dactylis glomerata*; *P.* (*T.*) *tomlini*, sp. n., found beneath the leaf-sheaths of *Ammophila arenaria*; and *Lepidosaphes ulmi*, L. The males of the last were found amongst a large colony on the stems of common broom, but as soon as this species attacks cultivated plants, it apparently adopts a purely parthenogenetic habit.

Schulz (N.). **Clothes Moth Caterpillar. Metabolism.**—*Biochem. Zeitschr.*, 1925, clvi, pp. 124–129. Berlin, 1925. (Abstr. in *Brit. Cotton Indust. Res. Assoc. Summ. Current Lit.*, v, no. 9, p. A.22. Manchester, 7th May 1925.) [Recd. November 1925.]

An account is given of the metabolism of *Tinea pellionella*, L. (common clothes moth). The larvae feed essentially on the keratin substance of wool and hair and select only the wool from mixtures of wool and cotton.

Moth-proofing Solutions.—*Brit. Cotton Indust. Res. Assoc. Summ. Current Lit.*, v, no. 16, p. K.98. Manchester, 24th September 1925.

The following solutions have been found efficient in protecting fabrics, fur, etc., from clothes moths:—(1) A neutral solution containing the silicofluoride of sodium, potassium, lithium, zinc or aluminium. The solution may also contain fluorides of the same metals, alkali metal salts of benzene-sulphonic acid or its derivatives, salts of naphthalene-beta-sulphonic acid or of its derivatives, and sulphates of the alkalis or of zinc or aluminium. (2) Solutions of the fluorides or silicofluorides with sulphates of the same metals and a small proportion of an organic acid, such as oxalic, tartaric, formic or acetic acid. (3) Solutions containing also stabilising and wetting agents, such as sodium oleate and gelatin.

Marchal (P.) & Vayssière (P.). **Etude sur la désinfection des produits végétaux et des denrées agricoles.**—*Ann. Epiphyties*, xi, no. 3, pp. 121–183, 10 pls., 14 figs., 83 refs. Paris, May–June 1925.

The latest methods and apparatus for the disinfestation of plants and plant products, as used in various countries, are reviewed, including the heat and hydrocyanic acid fumigation processes applied to mills, and the various fumigants, hot air and steam, immersion, hermetic ensilage and cold storage methods used at quarantine stations.

Dieuzeide (R.). **Les Champignons entomophytes du genre** *Beauveria*, **Vuillemin. Contribution à l'étude de** *Beauveria effusa*, **Vuill., parasite du Doryphore.**—*Ann. Epiphyties*, xi, no. 3, pp. 185–219, 10 figs. Paris, May–June, 1925.

The fungus, *Beauveria effusa*, known primarily as infesting silkworms, has proved to be a deadly and widespread enemy of *Leptinotarsa decemlineata*, Say (Colorado potato beetle) in Gironde, where it occurs in the soil in infested regions. The author has made a study of the fungus in the laboratory and of its effect on *L. decemlineata*. Infection is apparently first noticeable on the wings of the beetle, where the formation of cysts indicates that there may be some immunity reaction against it. The possible practical use of the fungus against *L. decemlineata* has not been investigated; but experiments in the laboratory have shown that the adults are killed by it during their hibernation in the soil, the mortality being sometimes as high as 50 per cent. In nature the mortality is probably not so high, as under the conditions of the experiments the insects were massed closely in a small space and the infection probably spread from one to another. If the soil is thoroughly sprayed with the fungus, under constant conditions of humidity, 50 per cent. of the beetles die in 15 days, and up to 100 per cent. in 35 to 40 days. In dry conditions the mortality never rises above 40 per cent. in the same time. The beetles are never affected during the period of their activity. As the larvae spend only a short time (12 to 15 days) in the soil, they are less liable to attack, but under the most favourable conditions mortality may reach 35 to 45 per cent. in 7 or 8 days. In dry conditions they never become infected. Infection by means of the digestive tract has never been obtained.

Feytaud (J.). **Sur la biologie et l'extinction des foyers de Doryphore.**—*Assoc. française Avancemt. Sci.*, C.R. 47th Sess., Bordeaux, 1923, pp. 551–558. Paris, 1924. [Recd. July 1925.]

This article summarises the work that has been done in connection with *Leptinotarsa decemlineata*, Say, in France.

Jacquet (E.). **Les Insectes nuisibles au Potager et au Verger.**—64 pp., illus. Paris, Soc. Pubns. Rurales [1925]. Price *Fr.* 1·50.

This popular guide is divided into two sections, the one dealing with insect pests of vegetable crops and the other with orchard pests. Only the popular names of the insects are given. Their habits and the methods for their control are briefly described.

Navarro (L.). **Plagas de Langosta.** [Locust Pests.]—62 pp., 12 figs. Madrid, Calpe, 1923. Price *Pta.* 1. [Recd. November 1925.]

This booklet, which is one of a series intended for Spanish agriculturists, gives a concise account of locusts under the headings of general, historical and geographical notes; description of *Dociostaurus maroccanus* and its biology; natural enemies of locusts; and measures adopted against them.

Saz (E.). **Una mosca proteccionista y la uva de Almería.** [A Protectionist Fly and Almeria Grapes.]—*Bol. Agric. téc. y econ.*, Sección doctrinal, xvii, no. 202, pp. 418–434, 9 figs., 1 map, 4 refs. Madrid, 31st October 1925.

It has been stated in Spain that the prohibition of the importation of Almeria grapes into the United States [*R.A.E.*, A, xii, 123] was due to the severe competition of the Spanish product with that of the Californian growers. It is contended that the possibility of grapes being infested by the Mediterranean fruit-fly, *Ceratitis capitata*, Wied., is not a sufficient reason for forbidding their entry, the inspection of shipments and rejection of those showing signs of infestation being an adequate measure. The infestation of grapes by *C. capitata* is accidental, occurring only in years when the fly is very abundant and other fruits are not available for oviposition. Cold storage of grapes from infested regions destroys all risk of infestation. Even should an infested shipment enter the United States, any flies thus introduced could not harm the American fruit crops owing to the late season of the year, and they would be quickly killed by the advent of winter.

Theobald (F. V.). **Entomological Department.**—*Ann. Rept. Res. & Adv. Dept.* [*S.E. Agric. Coll.*] *1924-25*, pp. 5–20. [Wye, Kent] 1925.

The most notable hop pests of 1924–5 were *Tortrix podana*, Scop., *T. heparana*, Schiff., and *T. rosana*, L., which are generally recorded as fruit pests and have not previously been known to feed on hops; the Aphids, *Macrosiphum solanifolii*, Ashm., also recorded for the first time from this crop, *Myzus chelidonii*, Kalt., and a new species, *Rhopalosiphoninus lupulinus*, of which the description is being published; *Typhlocyba* [*lethierryi*, Edw.], a yellow leaf-hopper that oviposits on the midrib and larger veins, the larvae hatching from early August to late September; *Euacanthus interruptus*, L. (hop jumper), of which the larval and nymphal stages are very injurious, but can be controlled by a spray of 12 oz. nicotine and 2 lb. soft soap to 100 gals. of water, dusts proving very inferior; *Calocoris fulvomaculatus*, DeG. (needle-nosed hop bug), which can be controlled by the same spray; and the weevil, *Plinthus caliginosus*, F., the larvae of which attack the roots.

Fruit pests included *Cydia pomonella*, L. (codling moth), which has increased considerably in the last two years; *C.* (*Opadia*) *funebrana*, Tr. (red plum maggot); *Byturus tomentosus*, F. (raspberry beetle), which was numerous late in the season and may cause much damage next year to raspberries and loganberries; *Tipula oleracea*, L. (leather-jacket), among strawberries; *Contarinia* (*Diplosis*) *pyrivora*, Riley (pear midge), which caused a shortage of pears for the season, but seemed to be checked considerably by the use of poultry; the earwig, *Forficula auricularia*, L., which caused damage on a large scale to plum blossoms, the insects sheltering in the sacking used for tying the young trees to stakes; and the Noctuid, *Mania maura*, L., which was injurious in the larval stage to buds of plums, peaches and nectarines.

The larvae of the weevil, *Ceuthorrhynchus quadridens*, Panz., and of the fly, *Phytomyza rufipes*, Mg., damaged seedling cauliflowers. *Barathra* (*Mamestra*) *brassicae*, L. (cabbage moth) was very abundant and attacked onions. *Eurinocola eucalypti*, Mas., an introduced Psyllid, has become well established on *Eucalyptus* trees in the open. Injurious introduced Aphids include *Idioptera nephrolepidis*, Davis, which attacks most kinds of ferns in commercial and private greenhouses, particularly maidenhair fern (*Adiantum*), and *Myzocallis arundicolens*, Clarke, and *M. arundinariae*, Essig, on bamboos. *Pemphigus eragrostidis*, Pass. (auricula root aphis) is often erroneously recorded as *Trama auriculae*, Murray; only apterous forms have so far been seen, and until winged forms are bred out its generic position must be left uncertain. It often causes the death of the auricula plants attacked. *Pemphigus bursarius*, L. (poplar and lettuce root aphis) destroyed numbers of lettuces by migrating from poplars and feeding on the lettuce roots. Most of the insects became winged in autumn and returned to poplars, but some remained on lettuce throughout the winter.

Minor pests included the sawflies, *Hoplocampa testudinea*, Htg., on apple, and *H. fulvicornis*, Klg., on plum; *Capitophorus ribis*, L., the only injurious currant aphis recorded; the Capsid, *Plesiocoris rugicollis*, Fall., on apple; and *Cydia nigricana*, Steph. (pea moth). In forests, *Paururus noctilio*, F. (steel-blue wood-wasp), *Pristiphora testacea*, Jur. (birch sawfly) and *Myzaphis abietina*, Wlk. (green spruce aphis), were all injurious.

Light traps caught vast numbers of Tortricids and many moths of other economic species, females in some cases being more numerous than males. Experiments with carbolineum resulted in the death of all Aphid and Psyllid eggs treated, and even of those of the winter moth [*Cheimatobia brumata*, L.] when the strength of the wash was increased to 10 per cent. No effect could be obtained, however, on the eggs of Capsid bugs on apples, nor against the apple bud moth [*Eucosma ocellana*, F.], nor *Coleophora* on plums. Experiments with calcium cyanide powder indicate that although most useful in glasshouses, it has not the same effect as an insecticide out of doors in this country as it has abroad.

[BOGDANOV-KAT'KOV (N. N.).] **Богданов-Катьков** (**Н. Н.**). **Halticids of the Vegetable Garden.** [In Russian.]—2nd edn., 28 pp., 1 pl., 37 figs. Leningrad, P. P. Soĭkīn, 1925. Price 40 *kop.*

The species of *Phyllotreta* that are more or less serious pests of cruciferous crops in northern Russia are *P. nemorum*, L., *P. vittata*, F., *P. nigripes*, F., *P. undulata*, Kutsch., and *P. atra*, F. Recently *P. fucata*, Wse., has been recorded as a pest from south-eastern Russia [*R.A.E.*, A, xiii, 144]. A general account of the habits of these species is given, with a key to them and other phytophagous Coleoptera occurring on cruciferous plants. The most injurious in northern Russia are *P. nemorum* and *P. undulata*. Besides the remedial measures previously discussed [*R.A.E.*, A, xiii, 143], various methods of sweeping the crops so that the beetles are caught on adhesive preparations are described.

[SAKHAROV (N.).] **Сахаров (Н.). The Sunflower Moth in Connection with the Cultivation of a Resistant Sunflower.** *Homoeosoma nebulella* **Hb. (Pyralidae).** [In Russian.]—82 pp., 4 pls., 1 map, 23 refs. (With a Summary in English.) Moscow, Novaya Derevnya [*New Village*], 1925. Price 80 *kop.*

The life-history and habits of *Homoeosoma nebulella*, Hb., are described in detail, with special reference to the cultivation of immune varieties of sunflowers [*cf. R.A.E.*, A, viii, 274]. In the lower Volga region there is only one complete generation a year, with a partial second brood, depending on climatic conditions. The parasites found attacking *H. nebulella* are the Ichneumonids, *Crematus ornatus* var. *variegatus*, Szepl., and *Exochus* sp., two Chalcids and a Braconid. Neither these nor other enemies, such as *Chrysopa perla*, L., and the fungus, *Oospora destructor*, appear to be of any economic importance.

As a result of breeding and selection it has been possible to raise resistant sunflowers. The quality is constant and depends on the formation of a carboniferous layer between the cork tissue and the sclerenchyma of the achene, which the larvae cannot penetrate. The eggs of *H. nebulella* are laid indiscriminately on all varieties of sunflowers, but the feeding of the larvae in the resistant types is not of great economic importance, as the carboniferous layer, consisting chiefly of carbon, of which it contains 76 per cent., develops quickly enough to confine the feeding of the larvae to the bottom of the seed cup. Where this layer does not occur, the larvae easily penetrate the achenes. The presence of such a layer, however, does not always protect plants from insect attack, as in the case of *Carthamus tinctorius*, which is severely injured by *H. nebulella* and the Trypetid, *Urellia eluta*, Meig.; in this plant, however, the growth of the layer is much slower.

[SAKHAROV (N.).] **Сахаров (Н.). Noctuids and their Control.** [In Russian.]—36 pp., 3 figs, 1 pl. Moscow, Novaya Derevnya [*New Village*], 1925. Price 10 *kop.*

This is a popular account of the life-history and habits of the cutworm [*Euxoa segetum*, Schiff.] as occurring in the lower Volga region. The recommendations for its control are early fallow, the use of trenches, and the sowing of spring crops in place of winter ones.

Report on the Work of the Entomological Department for 1920–1925. [In Russian.]—Saratovskaya Oblastnaya S. Kh. Opuitnaya Stantzīya [*Saratov Reg. Agric. Expt. Sta.*], 31 pp. Saratov, 1925.

This report consists of short summaries of the work of different investigators, some of which have already been noticed, including the immunity of some varieties of wheat from *Phorbia genitalis*, Schnabl [*R.A.E.*, A, xii, 141] by N. L. Sakharov.

In addition to the information already noticed with regard to the injurious moths of the genus *Biston*, etc. [*R.A.E.*, A, xiii, 473], a number of parasites attacking these moths are recorded. The work in connection with *Oscinella* (*Oscinosoma*) *frit*, L., is recorded by Sakharov. This is a serious pest, particularly of barley in Saratov. Considerable damage is also done to spring- and winter-sown wheat and to a less extent to oats. The generations overlap considerably, there being at least three in the year, but the first and last are of the greatest importance, the latter attacking winter-sown wheat. The distribution of *O. frit* depends on climatic conditions ; low summer temperatures with a high relative humidity produce the largest numbers of the fly. No immune varieties of the crops attacked have so far been found. General sound agricultural methods reduce the severity of the damage ; spring-sown wheat should be planted as early as possible and the winter crop as late as possible.

The Pyralids, *Salebria marmorata*, Alph., and *Etiella zinckenella*, Tr., which infest acacia [*Robinia*], are dealt with by O. A. Pīlyugīn. *S. marmorata* occurs only on yellow acacia and causes considerable injury to these trees. There is only one generation a year. The adults appear in May, emerging in much greater numbers at the beginning of June. The eggs are laid in cracks of the bark or at the base of the buds, etc., on one-year old shoots in batches of from 1 to 10, each female laying up to 500 eggs. They hatch in 7 days, and the larvae migrate to the leaves, which they skeletonise, this stage lasting from 25 to 30 days. Pupation occurs in the soil at a depth of about 1 inch, and the winter is passed in the pupal stage. The larvae are attacked by various parasites, the most important of which is *Zenillia libatrix*, Pz. The pest may be destroyed by spraying with barium chloride, 1 lb. to 40 gals. of water, or with 1 lb. sodium arsenite and 3 lb. lime to 120 gals. of water.

E. zinckenella occurs on white and yellow acacia and various other wild and cultivated leguminous plants, including peas, beans and lentils. There are two generations a year ; the eggs of the first are laid on yellow acacia and cultivated leguminous plants, those of the second on wild plants, the late varieties of the cultivated plants and white acacia. In the case of peas, beans, etc., the moths choose the pods on which the eggs can be laid in a position sheltered from the wind, such as beans with open calyces rather than where the calyx fits tightly round the pod. The eggs hatch in 10–21 days, the larval stage lasts 37–58 days, and the pupal one 14–17 days for the first generation and about 30 for the second. The parasites, *Pimpla strigifrons*, Thoms., *P. nigriscaposa*, Thoms., *Omorgus fusciplica*, Thoms., and *Agrypon stenostigma*, Thoms., have been reared from the larvae, which are also attacked by the fungus, *Botrytis bassiana*. It is advisable to sow pulse crops as far away as possible from acacia trees, and all wild leguminous plants should be destroyed wherever possible.

A study of *Lema melanopa*, L., carried out by V. A. Megalov has shown that this beetle does much injury to cereals. The eggs are laid on the leaves and hatch in 13–14 days. The larval stage lasts 12–13 days ; pupation occurs in the soil, and this stage lasts 14–15 days. Hibernation occurs in the adult stage. Both the adults and the larvae feed on the leaves, the latter skeletonising them. Barium chloride, usually recommended against the larvae, proved to be of little use. Owing to the somewhat protracted egg-laying period, the larvae occur on the plants for about 4 to 6 weeks, so that the application of insecticides would be too expensive to warrant their use. Of the materials tried against the adults, the best results were obtained with sodium arsenite and lime, 1 : 4, at the rate of 1 lb. to 96 gals. This measure is to be tried under field conditions during 1926.

The work on the control of *Athalia colibri*, Christ (*spinarum*, F.) on mustard is reported on by E. A. Lebedeva. Excellent results were obtained with sodium arsenite, 1 lb. to 3 lb. of unslaked lime and 120 gals. of water.

The weevil, *Lixus ascanii* var. *albomarginatus*, Boh., is a pest of mustard. The larvae live in the roots, and about the time the mustard matures, they cut through the stalk so that it collapses. This does not, however, appear to affect the production of seed to any extent or its germination. Whether the oil content of the seeds is affected requires further investigation.

[Bugdanov (G. B.).] **Бугданов (Г. Б.). On the Organisation of the Control of Orchard Pests in Relation to the Importance of the Latter for the Region.** [In Russian.]—Vladīkavkazskaya Stantzīya Zashchītui Rasteniĭ prī Gorskom S. Kh. Institute [*Vladikavkaz Plant Protect. Sta., Gorsky Agric. Inst.*], 16 pp., 1 photogr. Vladikavkaz, 1925.

The orchards of the Gorsky Republic are mainly devoted to apples, but pears and plums are also grown. Insect pests are extremely difficult to control owing to the indiscriminate arrangement of the orchards and the primitive methods of cultivation in general use. The chief pests are *Hyponomeuta malinellus*, Zell., *Eriosoma lanigerum*, Hausm., *Anthonomus pomorum*, L., and *Cydia* (*Carpocapsa*) *pomonella*, L. A general campaign for the control of these was undertaken in the spring of 1924. The organisation of the work is described, and as a result the crops for 1924 were doubled in all the treated areas as compared with the average ones for the previous four years.

Bugdanov (G. B.). **Nae Dyrhdonty Znagfaetkhujy Raempaeg** (*Hyponomeuta malinellus* **Z.**).—Vladīkavkazskaya Stantzīya Zashchītui Rasteniĭ prī Gorskom S. Kh. Institute [*Vladikavkaz Plant Protect. Sta., Gorsky Agric. Inst.*] 11 pp., 2 figs. Vladikavkaz, 1925.

This is a popular account of the life-history and control of *Hyponomeuta malinellus*, Z., in Ossetia (Gorsky Republic). It is the first work on applied entomology in the Ossetin language.

[Korotkīkh (A.).] **Коротких (А.). On a New Front.** [In Russian.]—Samolet [*Aircraft*], ii, no. 9, (23), pp. 37–38, 5 figs. Moscow, September 1925.

The Commissariat of Agriculture of Russia, in conjunction with the Air Force, organised, during the summer of 1925, extensive field experiments in the control of locusts by means of dusting from aeroplanes. The experiments were undertaken in the vast reed-beds of the lower reaches of the River Kuma, in the Northern Caucasus, the locust concerned being *Locusta migratoria*, L.

The results of the experiments are satisfactory. The use of a dry dust gives as high a percentage of mortality in locusts as spraying with about the same quantity of poison per acre. The formation of clouds of dust by special mechanical devices from aeroplanes flying at about 7–10 feet above the tops of the plants is quite possible. The quantities of poison used in a second or per acre can be regulated with sufficient accuracy. The adhesiveness of poisons both pure and mixed is satisfactory, and the poison remains on the plants and retains its toxicity for two or three days. Penetration of poison dust into the densest vegetation is complete. Wholesale poisoning of locusts was observed when using 10–12 pounds of Paris green or sodium arsenate per dessiatine [2·7 acres] where the plots dusted were covered with dense nd tall vegetation. One aeroplane during an hour's flight, under experimental conditions, covered up to 270 acres, but in practice, after certain technical improvements have been made, this figure should be considerably increased. In all about 2,700 acres were dusted by the expedition, though there was no original intention to do practical control work. Aeroplanes simplify scouting work for locusts, since swarms on the ground and on vegetation are visible from heights up to 3,000 feet.

The method was found most effective against swarms of hoppers, ut dusting resting swarms of adults is also possible, though only very early in the morning; later in the day swarms of flying locusts are easily disturbed, take wing, surround the aeroplane and get into the holes of the radiator, making further flight impossible.

Dusting was found to have some unpleasant effects on the men employed, causing both external and internal poisoning, and the airmen had to work in respirators.

De Jong (W. H.). **Een studie over Emelten en hare bestrijding.** [A Study on Tipulids and their Control.]—*Verslagen Meded. Plantenziektenk. Dienst*, no. 42, 126 pp., 3 figs., 2 pls., 56 refs. Wageningen, November 1925.

Some of the information given here on Tipulids and their control has been noticed from previous papers [*R.A.E.*, A, xi, 119; xiii, 165]. The species of the type of *Tipula oleracea* are regarded as comprising *T. oleracea*, L., *T. paludosa*, Mg., and a species identified by Czizek as *T. oleracea*, but here treated as *T. czizeki*, sp. n., and a comparative description of these is given. Only one of them may occur at a given time or place. In early August *T. paludosa* may be present, while the second generation of *T. oleracea* has not yet appeared. *T. paludosa* may also be the only species in a given locality. *T. oleracea* is generally the only species found in May. In October *T. czizeki* predominates. These facts explain why workers, such as Bodenheimer, have thought there was only one species [*R.A.E.*, A, xi, 201]. Particulars are given as to mating, oviposition and the duration of the early stages. The males predominate.

Other Tipulids dealt with are *T. vernalis*, Mg., *T. lunata*, L., *T. luteipennis*, Mg., *Pachyrrhina maculata*, Mg., *P. crocata*, L., and *P. pratensis*, L. The eggs of *T. oleracea*, *T. paludosa*, *P. crocata* and *P. pratensis* hatch in a fortnight; those of *P. maculata*, *T. vernalis* and *T. lunata* and the American species, *T. simplex*, Doane, have a summer resting period; while those of *T. czizeki* and *T. luteipennis* have a winter one. The author considers that parts of living plants form a considerable part of the food, especially of the larvae of *T. paludosa*. The injury done by Tipulid larvae, the plants attacked, and the various measures that have been employed against them are reviewed.

Willemse (C.). **Revision der Gattung** *Oxya* **Serville (Orthoptera, Subfam. Acridiodea, trib. Cyrtacanthacrinae).** [Revision of the Genus *Oxya* Serville.]—*Tijdschr. Ent.*, lxviii, pp. 1–60, 65 figs. The Hague, 1925.

A key is given to the females of this genus, with descriptions of a number of new species, among which are *Oxya oryzivora* on rice, and *O. bidentata*, *O. uvarovi* and *O. multidentata* on sugar-cane, in India, the last also occurring on rice in the Federated Malay States.

Oudemans (A. C.). **Acarologische Aanteekeningen. lxxviii.** [Acaro-logical Notes, lxxviii.]—*Ent. Ber. Ned. Ent. Ver.*, vi, no. 14 pp. 400–410. The Hague, 1st July 1925. [Recd. November 1925

The author now agrees that two hypopial forms of the mite, *Tyro-glyphus farinae*, L., occur [*R.A.E.*, A, xiii, 108]. *T. farris*, Oud., thu becomes only a race of *T. farinae*.

Werth (E.). **Zur wirtschaftlichen Bedeutung des Apfelblütenstechers** [The Economic Importance of the Apple Blossom Weevil.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, v, no. 11, pp. 88–89 Berlin, November 1925.

An increased abundance of the apple blossom weevil [*Anthonomu pomorum*] occurred in 1925 in various parts of Germany, with, in some localities, a reported loss of from 80 to 100 per cent. of the crop. In view of these figures the author gives the results of a critical observation of experimental plots at the Imperial Biological Institute. The attack varied from 1 to 45 per cent. according to the variety of apple. This percentage is much below the percentage of natural loss (*i.e.*, failure of blossoms to develop into fruits), which was between 61 and 83 per cent. of the total blossoms. Attack by *A. pomorum* can only result in an actual loss if added to the natural loss, but as shown in a graph the curve for the natural loss does not rise with that for the weevil attack. In the author's opinion the formation or non-formation of fruit is decided after the weevil attack. Weevil injury can thus have serious results only if it approximates to the amount of natural loss, and this is a very unlikely contingency. It is remarkable that the reports sent in never mentioned any infestation of pears by this weevil, though it was noticed at the Institute in many varieties of pears.

Speyer (W.). **Die Lebensdauer des Apfelblütenstechers** (*Anthonomus pomorum*, **L.**). [The Duration of Life of the Apple Blossom Weevil.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, v, no. 11, pp. 89–91, 4 figs. Berlin, November 1925.

Experiments have shown that *Anthonomus pomorum* in Germany may live for two years and have two oviposition periods [*R.A.E.*, A, x, 617 ; xi, 401]. Since then it has been found that the majority of the adults emerging from pupation in May do not survive two winters (a number died in the first winter); but many individuals lived for over three years, and one survived for 49 months. It is estimated that in nature about 40 per cent. of the weevils pass through a second mating period. The practical point is that one complete destruction of existing larvae cannot end an infestation, and it is necessary to do this for two consecutive years, or to destroy the adults at the same time as the larvae.

Bremer (H.). **Ist tiefes Umpflügen der Aecker zur Vernichtung von Feldschädlingen anzuraten ?** [Is deep Ploughing advisable for the Destruction of Field Pests ?]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, v, no. 11, pp. 91–92. Berlin, November 1925.

Against a field pest of which one of the stages is subterranean, ploughing is often recommended for the purpose of either burying it or bringing it to the surface. In the case of the beet-fly, *Pegomyia* *hyoscyami*, Pz., Rambousek (Czechoslovakia) states that the pupae hibernate at a depth of 10 inches and should be turned up and exposed to frost and rain. In 1896 Sirrine (U.S.A.) suggested ploughing them under so as to prevent the adults from reaching the surface. The author states that in Germany the pupae are quite close to the surface and are very resistant to frost. He found that the adults could emerge from a depth of 16 inches, and Kemner has observed this at 19 inches.

An examination to a depth of 10 inches was made in January 1925 of two plots, one ploughed and the other left unploughed, of a beet-field that had been heavily infested in 1924 by *P. hyoscyami*. In the unploughed land 7 pupae were found per ¼ square yard, at depths of ⅘–1¾ inches. In the land worked with an 8-inch deep ploughshare, 8 pupae were found at 1¾–4 inches, and 7 at 4–10 inches. It is therefore improbable that the majority of the pupae of *P. hyoscyami* can be adequately buried by ploughing.

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, Beilage, no. 4, pp. 49–68. Berlin, 1st November 1925.

The preceding issue has already been noticed [*R.A.E.*, A, xiii, 576]. This part includes a list of European customs houses outside Germany where plants other than grape-vines can be passed ; the modifications in Swedish regulations on poisons ; and the Spanish decree of 20th July 1924, regulating the importation of live plants.

GASOW (H.). **Der grüne Eichenwickler als Forstschädling.** [The Green Oak Tortrix as a Forest Pest.]—*Anz. Schädlingsk.*, i, nos. 10–11, pp. 111–114, 121–124. Berlin, 1925.

Much of this information on *Tortrix viridana*, L., has already been published [*R.A.E.*, A, xiii, 395]. The eggs are laid in pairs on the branches and are much scattered, so that they are less exposed to attacks of enemies. In Germany a second generation is unlikely, particularly after a dry, hot summer.

Insect enemies of *T. viridana* include the common earwig [*Forficula auricularia*, L.] ; the predacious Carabids, *Calosoma sycophanta*, L., and *C. inquisitor*, L. ; the Silphid, *Silpha quadripunctata*, L. ; and a number of Hymenopterous parasites including *Pimpla maculator*, F., and *P. rufata*, Gm. Tachinid parasites include *Actia exoleta*, Mg., which has not been previously recorded from this host.

Many difficulties will have to be overcome before dusting with insecticides from aeroplanes can be used against this pest over large areas. For small ones a powerful dust-gun may prove successful. For re-planting, such oaks as *Quercus sessiliflora*, which suffers little from *T. viridana*, should be chosen.

STADLER (—). **Ueber** *Sirex*-**Schaden.** [On Injuries by *Sirex*.]—*Anz. Schädlingsk.*, i, no. 11, p. 130. Berlin, 1925.

These observations on *Sirex gigas* were made in Bavaria at altitudes up to about 4,500 feet. The female deposits eggs in August, usually in newly-felled, barked logs. The resulting larvae probably perish when the logs are being sawn up. Standing timber, of which the sapwood has been exposed, is also chosen for oviposition. Only healthy wood is infested. The actual injury by the larval mines is not important, but rain and snow lodge in them and cause rotting. *S. gigas* is rare above about 3,000 ft. A smaller species, probably *S. spectrum*, also occurs in Bavaria.

ANDRES (A.). **Parasit von** *Gracilaria azaleella* **Brant. (Lep.).** [A Parasite of *G. azaleella*.]—*Anz. Schädlingsk.*, i, no. 11, pp. 130–131. Berlin, 1925.

In 1925 the author found that almost 90 per cent. of the larvae of *Gracilaria azaleella*, Brants, in the municipal gardens of Frankfurt on Main were parasitised by a Chalcid as yet unidentified.

WEIGAND (A.). **Erfolgreiche Bekämpfung der Schnellkäferlarven.** [Successful control of Elaterid Larvae.]—*Deutsche Zuckerindustrie*, xlix, p. 1017. Berlin, 1924. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1925, no. 3, p. 12. Vienna, 1925.)

The use of finely ground kainit is recommended against wireworms infesting beet. It should be dug in in wet weather when hoeing the plants, and in constantly infested fields 530 lb. per acre should be used.

ESCHERICH (K.). **Streudüngung und Drahtwurmbefall.** [Manuring with Forest Litter and Infestation by Wireworms.]—*Forstw. Zentralblatt*, xlvi, pp. 645–648. Berlin, 1924. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1925, no. 3, p. 13. Vienna, 1925.)

The substance of this paper on the carriage of wireworms in forest litter is the same as that of one already noticed [*R.A.E.*, A, xiii, 103].

EIDMANN (H.). **Beobachtungen über** *Dioryctria splendidella* **H. Sch.** [Observations on *D. splendidella*.]—*Forstw. Zentralbl.*, xlvii, pp. 98–108, 7 figs. Berlin, 1925. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1925, no. 3, pp. 15–16. Vienna, 1925.)

The information given here has been noticed from another paper [*R.A.E.*, A, xiii, 103].

RŮŽIČKA (J.). **Die neuesten Erfahrungen über die Nonne in Böhmen.** [The Latest Experiences on the Nun Moth in Bohemia.]—*Zentralbl. f. d. gesamte Forstwesen*, l, pp. 33–67, 159–185, 315–336, figs. Vienna, 1924. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1925, no. 3, p. 18. Vienna, 1925.)

This report on the nun moth [*Lymantria monacha*] in Bohemia deals with the biology, diseases, natural enemies, relation to climate, and feeding of this pest, and with the measures to be taken against it.

HENSEL (—). *Selenephera lobulina* **und** *lunigera* **Esp.**—*Jahresheft Ver. schles. Insektenkunde*, no. 14, pp. 34–39. Breslau, 1924. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1925, no. 3, pp. 20–21. Vienna, 1925.)

The caterpillars of the Lasiocampid, *Selenephera lunigera*, Esp., and var. *lobulina*, Esp., feed on spruce needles up to the end of November and then again from the end of February. During the winter they remain on the branches. The pupae are found on the spruce trees. They are not eaten by birds.

Zacher (F.). **Theorie und Praxis der Schädlingsbekämpfung in Handel und Industrie.** [The Theory and Practice of Pest Control in Commerce and Industry.]—*Mitt. Ges. Vorratsschutz*, i, no. 1, pp. 3–6. Berlin, November 1925.

The losses to stored products caused by insects, fungi and bacteria are estimated to amount to £15,000,000 a year in Germany. A Society such as that for the Protection of Stored Products should therefore be supported by merchants and manufacturers.

Zillig (—). **Zerstörung von Starkstrommasten durch den Hausbock.** [The Destruction of Electric Power Cable Posts by *Hylotrupes bajulus*.]—*Mitt. Ges. Vorratsschutz*, i, no. 1, p. 8. Berlin, November 1925.

The Cerambycid, *Hylotrupes bajulus*, L., has proved very injurious in spruce and pine poles carrying power cables near the city of Treves, owing to the fact that during the war the poles were not impregnated with creosote but were treated with cyanide or crude naphthaline. Posts near inhabited localities were more severely attacked than those in the open country. The attack does not usually extend above 6 ft. from the ground. Larval development occurs in the sap-wood and takes about three years. Impregnation with creosote is regarded as an effective preventive, but the duration of the protection conferred is not known.

Krieg (—). **Die Bekämpfung der Obstmade.** [Measures against the Fruit-maggot.]—*Rheinische Monatsschr. Obst-, Garten- u. Gemüsebau*, xviii, no. 7, pp. 127–128. Bonn, July 1925. [Recd. December 1925.]

A series of spraying experiments on apples, of which a description is given, has shown that lead arsenate, applied when the petals have fallen and before the calices have closed, is a most effective remedy against *Cydia pomonella*.

Paoli (G.). **Nuovi dati sulla biologia del fleotripide dell'olivo.** [New Data on the Biology of *Phloeothrips oleae*.]—*IX Congresso naz. Olivicoltori, Bari, 19–21 Ottobre 1925*, separate, 3 pp., 1925.

Phloeothrips oleae, Costa, finds a convenient refuge, especially in winter, in the mines of the boring beetle, *Phloeotribus scarabaeoides*, Bern., and other injurious insects, and in the scabs due to *Bacillus oleae*. In September 1925 the author observed in Tuscany normally productive olive trees that had suffered so heavily from *P. oleae* in the current year that the crop failed entirely. Though there was a fairly marked infestation of the fly, *Clinodiplosis oleisuga*, Targ., its galls did not harbour *P. oleae*, and the thrips were mainly found in the scales of *Saissetia oleae*, Bern., that had been parasitised by the larvae of *Scutellista cyanea*, Motch. When this parasite has emerged, it leaves an empty scale which forms an ideal shelter, and two such perforated scales produced between them 20 examples of *P. oleae*.

MALENOTTI (E.). **Impressioni sull'andamento della decorsa campagna bacologica.** [Impressions on the Course of the past Silk-worm Season.]—*L'Italia Agricola,* 15th October 1925. Reprint, 7 pp., 3 figs. Piacenza, 1925.

The fact that *Bombyx mori,* L., has become domesticated is not considered to have rendered it more susceptible to bacterial infections. Pebrine, which is most fatal to it, is also a serious disease of wild Lepidoptera such as *Arctia caja,* L.

The bug, *Lyctocoris campestris,* F., was first recorded as an enemy of the larvae of *B. mori* in 1921 [*R.A.E.*, A, ix, 404], but cannot attack them when in the cocoon as was originally stated.

MALENOTTI (E.). **Contro i Dermestidi dei bozzoli.** [Against the Dermestids attacking Silk-worm Cocoons.]—*Bull. dell'Agricoltura,* 1925, no. 42. Reprint, 8 pp. Milan, 1925.

When enclosed in its cocoon the larva of *Bombyx mori* is protected against most enemies, except mice and Dermestid beetles. While other Coleoptera occasionally attack it, those chiefly concerned belong to the genus *Dermestes,* especially *D. lardarius,* and to a less degree *D. frischi, D. vulpinus, D. murinus,* etc. Observers are not agreed as to the method of attack. The author considers that the beetle larvae may gain entrance to the cocoon even if the adults have not pierced it. The larvae do not pupate in the cocoon and do not always wait to become mature before emerging. The best measure against these beetles is the use of baits consisting of cocoons that have died of disease, as their odour is attractive. The beetles are collected from these baits once every 24 hours.

MALENOTTI (E.). **Gli insetticidi e il loro impiego in agricoltura. (Nota preliminare.)** [Insecticides and their Employment in Agriculture. Preliminary Note.]—*R. Osservatorio fitopatol. per Verona,* 20 pp., 1 fig. Verona, 1925.

This is a survey of the various classes of insecticides, the properties of which are briefly discussed. Auxiliary substances, such as carriers and adhesives, are also described.

PAILLOT (A.). **Sur la préparation d'émulsions d'huiles minérales en bouillies cupriques pour le traitement d'hiver des arbres fruitiers.**—*C.R. Acad. Agric. France,* x, pp. 1044–1046. Paris, 1924. Also in *Bull. Agric. Alg.-Tun.-Maroc,* xxxi, no. 10, pp. 220–221. Algiers, October 1925.

A form of oil emulsion that is simpler to prepare than one previously recommended [*R.A.E.*, A, xiii, 296] and gives more uniformly good results is made as follows :—A thick milk of lime is prepared, using 5 gals. boiling water to 40 lb. hydrated lime ; 10 gals. paraffin oil are then stirred in very gradually to the lime while still hot, until a thick paste is obtained. This is diluted with 10 to 15 gals. water, and then thoroughly mixed with a solution of 20 lb. copper sulphate in 25 gals. water. Water is then added to bring the whole to 100 gals. This emulsion will remain in suspension for several weeks and will not clog ordinary apparatus ; the addition of casein or sodium sulphoricinate is unnecessary. Lubricating oil that has been used in petrol-driven motors is an excellent substitute for the paraffin and apparently less is required, but the minimum dose has not yet been determined.

WILKINSON (D. S.). *Carpocapsa.—Cyprus Agric. Jl.*, xx, pt. 4, pp. 134–136, 1 pl. Nicosia, October 1925.

The control of *Cydia* (*Carpocapsa*) [*pomonella*, L.] is compulsory in Cyprus. A brief account is given of its life-history and the remedial measures to be adopted; the latter are the application of lime-wash to the trunks of all trees liable to attack, banding, and the collection and destruction of all fallen fruit.

BEESON (C. F. C.). **The Deodar Defoliator** (*Ectropis* **sp. nov., Geometridae**).—*Indian Forester*, li, no. 11, pp. 565–572, 1 pl. Allahabad, 1st November 1925.

During 1921–1925 deodar forests in the outer ranges of the Western Himalayas have been seriously damaged by the larvae of *Ectropis* sp. The outbreaks have been sporadic, lasting generally for two years and then suddenly dying out. Considerable areas of pure deodar forests are completely defoliated in the spring, resulting in a fresh growth of leaves in July; in the year following a severe defoliation up to 30 per cent. of the trees die. After defoliation in two consecutive years, still more serious mortality of the trees may occur. The smaller trees are more often killed than the larger ones.

The moths emerge during February; the females cannot fly. The young larvae are found early in April and mostly resemble the deodar needles in colour; when older, their colour resembles that of the young twigs. In June they descend from the trees and pupate in the humus that forms the forest floor; no cocoon is made. There is only one generation a year. The chief factors affecting the abundance of the insect appear to be spring rainfall and natural enemies. Heavy rain or hail in March and April is sufficient to destroy enough of the young larvae to prevent serious defoliation. The most important natural enemies are the Carabid, *Calosoma beesoni*, Andr., which is predacious on the larvae in its adult stage and on the pupae in its larval stage, and an Ichneumonid, *Campoplegidea* sp. A Tachinid parasite also occurs, but is much less numerous. A sample of humus yielded 8,000 pupae, dead and alive, of *Ectropis*, 1,600 larvae of *C. beesoni*, 760 Hymenopterous cocoons, and 80 Tachinid puparia; only 30 per cent. of the *Ectropis* pupae were living. It appears that the predators and parasites increase very rapidly when an outbreak of *Ectropis* occurs, and that by the third season they are able to suppress it. On gently sloping ground the humus should be raked into heaps and compacted in the autumn following the occurrence of the larvae of *Ectropis*; by this means conditions unfavourable to the emergence of the adults are created, without hindering the development of the predators. On steep and rocky ground the trees should be grease-banded in the early spring to prevent the females and young larvae from ascending them.

TUNSTALL (A. C.). **The Concentration of Lime-sulphur Solution.**—*Indian Tea Assoc., Scientif. Dept., Qtrly. Jl.*, 1925, pt. 3, pp. 114–116. Calcutta, 1925.

The average annual loss to the tea industry from pests and diseases is not less than 40 lb. per acre. Although the eradication of any of these pests or diseases would be so expensive as to be economically impossible, at least half the annual loss can be avoided by the general application of a suitable spray each cold weather. The most useful spray for this purpose is lime-sulphur solution ; the best solution is generally the strongest that can be used without injuring the bushes, the formula recommended being quick-lime 20 lb., sulphur $22\frac{1}{2}$ lb., water 50 gals. The lime is slaked by adding water gradually, and is then boiled with about 30 gals. water ; while it is boiling the sulphur is added gradually, and boiling water is then added to make up the volume to 50 gals. ; the solution is boiled for an hour, the volume being maintained by the addition of boiling water. This solution has a specific gravity of about 8° Bé. ; although not the best chemically, the above formula has the advantage of giving very constant results in spite of small inaccuracies that may occur in its preparation.

A table is given to show the dilution necessary for commercial lime-sulphur of known specific gravity for application to tea in various stages of growth. The approximate quantity of spray required for an acre of tea under various conditions is also given ; this depends on the size of the bushes and the means of application, especially the type of the spray-nozzle used.

GHOSH (C. C.). **Report of the Entomologist, Mandalay, and Sericultural Work for the Year ended 30th June 1924.**—8+5 pp. Rangoon, 1924. [Recd. November 1925.]

Rice pests during the year included *Pachydiplosis oryzae* (paddy-stem gall-fly), *Schoenobius incertellus* (*bipunctifer*), *Chapra mathias* (leaf-roller) and *Hispa armigera*. On sugar-cane, the only pests of importance were termites. *Cajanus indicus* was badly damaged by larvae of the Pyralid, *Maruca testulalis*, which is generally a minor pest of peas and beans. Caterpillars of *Heliothis* (*Chloridea*) *obsoleta* and of *Lampides* (*Polyommatus*) *baetica* were prevalent, generally on leguminous field crops ; *Agromyza* sp. (stem-boring fly) caused some damage to peas and beans ; and flea-beetles were also injurious to the latter. Safflower was attacked by Aphids, and larvae of *Perigea capensis* caused damage to the capsules. Cotton was severely attacked by *Earias insulana* and *E. fabia*.

In experiments with the fungus, *Penicillium anisopliae*, against *Oryctes rhinoceros* (palm beetle) and *Xylotrupes*, in the case of the former the spores had to touch the grubs in order to be effective, and in that of the latter the grubs were resistant to the fungus, but succumbed to it soon after pupation. Trials against cockchafers (*Holotrichia* sp.) in the larval stage gave negative results. Experiments in lac inoculation on various plants are described. In many forest areas lac occurs naturally, and it is thought that *Acacia catechu*, *A. leucophloea* and *Butea frondosa* will support good crops of lac if the right kind is introduced on to them.

Some damage was caused to mulberry trees used for silkworm culture by cockchafers, *Holotrichia* sp., which defoliated the plants in April and May, the higher and taller plants being first attacked.

GHOSH (C. C.). **Cultivators' Leaflets.**—*Dept. Agric. Burma*, nos. 16, 19–21, 25–29, 33, 38–42, 48, numerous figs. Mandalay [n.d.]

Each of these leaflets contains a brief and popular description of the insect concerned (usually under the popular name only) and of its life-history and habits, with recommendations for its control. The pests dealt with include the red cotton bug [*Dysdercus cingulatus*, F.]; the rice Hispid [*Hispa armigera*, Ol.]; *Spodoptera mauritia*, Boisd., occurring in rice seed-beds; the lemon butterfly [*Papilio polytes*, L.]; cotton bollworms; *Cerococcus hibisci*, Green, on cotton; the rice case-worm [*Nymphula depunctalis*, Guen.]; *Cirphis unipuncta*, Haw., on *Sorghum*, rice, etc.; *Sitotroga cerealella*, Oliv. (paddy grain moth); and paddy stem borer [*Schoenobius incertellus*, Wlk.]. Leaflet no. 48 deals with seed-storage and prevention of damage by insects.

Isaac (P. V.). **The South Andaman Coconut Slug-caterpillar** (*Thosea unifascia*, **Wlk.**).—*Agric. Jl. India*, xx, pt. 5, pp. 373–379, 2 pls. Calcutta, September 1925. [Recd. November 1925.]

Serious damage has been done to coconut palms in the Island of South Andaman during 1922, 1924, and 1925 by the larvae of the Limacodid, *Thosea unifascia*, Wlk. The coconut is an introduced plant in the Islands, and it is grown under poor conditions of soil and cultivation, so that the importance of the pest is intensified. Each female of *T. unifascia* lays about 400 eggs, mostly singly, on the lower surface of the leaves. The larvae hatch in about 5 days and feed on the lower surface of the leaves, which they skeletonise, sometimes defoliating all the trees over a restricted area. They feed for about 8 weeks and pupate in a cocoon spun in a dark place, either in the axils of the leaves of the trees, or in the ground to a depth of 4 ins. The pupal period lasts about 3 weeks. The moths are nocturnal and are strong fliers. The life-cycle occupies about 12 weeks, and there are 4 generations a year, the adults emerging about March, June, September, and December. Larvae have been found feeding on the leaves of *Barringtonia racemosa*, which is probably one of the indigenous food-plants. They are parasitised by a Braconid, which destroys large numbers. Birds, especially crows and mynahs, feed on the larvae, and they are also attacked by a wilt disease of fungus or bacterial origin.

As a means of control in the early stages of an infestation, the leaves and leaflets attacked may be cut off and burned. An attempt to burn the larvae by torches while on the leaves was unsatisfactory, as they were not always killed, and the trees were sometimes damaged. The cocoons in the axils of the leaves may be destroyed by means of a long knife, while those in the soil at the foot of the trees may be hoed up and collected by hand. Numbers of the moths can be captured by means of a simple light trap, consisting of a hurricane lantern over a tub of water covered with a film of kerosene. One light trap to about 4 acres is sufficient; it should be kept going for about two weeks.

T. unifascia has been taken in Burma, but nothing is known of its life-history there. An allied species, *T. sinensis*, Wlk., has been reared from larvae feeding on rose leaves in Rangoon, and *T. cinereomarginata*, Banks, has been recorded as damaging coconut palms in the Philippines.

Hutson (J. C.). **Report of the Entomologist.**—*Ceylon Administ. Repts., Dept. Agric., 1924*, pp. D 15–16. [Colombo, 1925.]

Most of the pests recorded in this report have already been dealt with in recent papers [*R.A.E.*, A, xi, 314–316; xii, 372, 522; xiii, 356–358, 519]. The Pyralid, *Piesmopoda rufimarginella*, is becoming established in at least one district and must be regarded as a potential pest of tea. A serious outbreak of the Limacodid, *Thosea recta*, occurred on tea on one estate. Other minor tea pests included *Zeuzera coffeae* (red borer), *Heterusia cingala* (red slug), and *Tetranychus bioculatus* (red spider-mite), *Tarsonemus translucens* (yellow mite), and *Brevipalpus obovatus* (scarlet mite), which were unusually prevalent during the year.

Larvae found boring in the stems and tap-roots of rubber trees were probably *Batocera rubus*; *Arbela quadrinotata* (brown bark-borer) was found in a living branch of a rubber tree; it is a common pest of cacao and also occurred in *Albizzia*. Minor pests of coconut leaves included *Thosea aperiens, Elymnias fraterna* and *Aularches miliaris* (spotted locust). *Helopeltis* was prevalent on cacao in some districts.

Cotton pests were :— *Platyedra gossypiella* (pink bollworm), which is becoming prevalent in the Southern Province, *Cosmophila indica, Earias* spp., *Sylepta derogata, Eupterote geminata, Stauropus alternus,* which was recorded for the first time on cotton in Ceylon, and *Dysdercus cingulatus.*

Pests of miscellaneous plants were :—*Araecerus fasciculatus,* the larvae of which damaged the pods of *Tephrosia candida*; *Dichomeris ianthes* on *Indigofera* sp.; *Terias silhetana* on *Albizzia*; *Hypsipyla robusta,* which did serious damage to toon [*Cedrela toona*], and also attacked mahogany (*Swietenia* spp.), which latter tree was also attacked by *Zeuzera coffeae* and the leaf-eating caterpillars of a species of *Macalla* near *M. moncusalis*; *Calotermes militaris* and *C. greeni,* in branches of *Grevillea*; *Terastia meticulosalis* (dadap shoot and stem borer) and *Aularches miliaris,* which damaged dadap (*Erythrina*); *Agrotera coelatalis,* the larvae of which fed on the leaves of *Vitex altissima*; the beetles, *Apogonia rauca, Nodostoma bituberculata,* and *Myllocerus dorsatus* on roses; *Cosmopolites sordidus* and *Odoiporus longicollis* in the root and stem, respectively, of bananas (*Musa*); and *Cosmophila indica* (cotton-leaf caterpillar) on the leaves of *Hibiscus rosa-sinensis* and *H. sabdariffa,* the former plant and *H. esculentus* being also attacked by *Acontia transversa.*

JARDINE (N. K.), REEVE (A. T.) & JEBARATNAM (M. R. M.). **Division of Plant and Diseases Inspection.**—*Ceylon Administ. Repts., Dept. Agric., 1924,* pp. D 17–19. [Colombo, 1925.]

Most of the insects recorded in the three reports of this division are also included in the preceding paper. The shot-hole borer of tea [*Xyleborus fornicatus*] has not spread so much as in previous years, but it is present in probably 90 per cent. of tea gardens in the Central Province; its prevalence is due chiefly to lack of adequate cultivation and ignorance of plant sanitation, but also to evasion of government regulations. The Capsid, *Disphinctus numeralis,* was taken on tea for the first time. The most important pests of tea in the Southern Province were *Calotermes* spp., especially *C. dilatatus. Prodenia litura* occurred on banana, and *Arbela* sp. in rubber. In the Eastern Province eradication of *Nephantis serinopa* (coconut caterpillar) has been attempted; the chief means employed was the cutting and burning of infested leaves, which has had good results; small numbers of parasites have also been liberated with some degree of success. Serious damage to rice in the Eastern Province was caused by *Spodoptera mauritia* (paddy swarming caterpillar), the early crops suffering more than the intermediate ones, which benefited from flooding that destroyed the young larvae. *Leptocorisa varicornis* (paddy bug) and *Schoenobius* *ncertellus* (*bipunctifer*) (paddy stem-borer) also did some damage to ice in the Eastern Province, and a severe outbreak of a leaf-hopper, *Niloparvata greeni*, occurred in the Southern Province. Minor pests of ice included *Nymphula depunctalis*, *Parnara mathias*, and *Cnaphalo-rocis medinalis*. Pests of cotton in the Southern Province included *Oxycarenus* sp., and in the Eastern Province young cotton plants were attacked by crickets, but were protected by heaping earth round the stems until they were about a month old.

GATER (B. A. R.). **Investigations on "Tuba."**—*Malayan Agric. Jl.*, viii, no. 10, pp. 312–329, 3 refs. Kuala Lumpur, October 1925.

In the introduction to this paper the author expresses the view that Derris, the substance to which the name " tuba " is usually applied, has only a limited value as an insecticide; in efficiency it may be compared with nicotine, but being cheaper than the latter, it may replace it to a large extent. Although it is both a contact and a stomach poison, its practical use will probably be confined to the former aspect. It is a very convenient substance for use in the country in which it is grown, but the possibilities of growing it for export are limited by the fact that chemical insecticides can generally be produced much more cheaply than vegetable insecticides. Derris, although not exceedingly poisonous to the higher animals, is toxic, and must be used carefully. The method of preparing a water extract for use in spraying on estates where derris is grown is described. The extract loses its efficiency after two days.

The remainder of the paper consists of two parts; the first part contains records of investigations into the insecticidal properties of the various substances called "tuba" by the Malays, and used by them as fish poisons; the second part deals with the insect pests of *Derris*. Water extracts of "tuba" plants not belonging to the genus *Derris* were tested for their insecticidal properties by immersing larvae of *Parasa herbifera*, Wlk., in them for half a minute; although several of the plants tested proved toxic to the larvae, none compared in efficiency with extracts of *Derris* at the same dilution. The roots of 8 species and varieties of *Derris* were obtained, of which the specific identity of 1 only was known; these were ground in a drug mill, and water extracts were prepared from the powders. The extracts were tested by immersing larvae of a Pyralid, *Tirathaba* sp., in them for 50 seconds. The best results were given by the variety of *Derris elliptica* known as "tuba imba". It was found that the order of the toxicity of the different varieties and species corresponded very closely with the order of fineness of the powders obtained by grinding the roots, the finest powders making the most effective insecticides when prepared as water extracts. It is considered that the results obtained are not necessarily definite in stablishing the relative toxicity of the species of *Derris*, on account of the difficulty of employing an accurate technique, but it is thought they indicate sufficiently the most suitable variety for local use.

It is only occasionally that serious damage is caused to *Derris* by leaf-eating insects, and control will probably be confined to hand picking, on account of the difficulty and high cost of spraying among ts creeping stems and matted foliage. However, as the importance of nsect pests may increase if *Derris* is grown on a large scale, a list is given of all the insects that have so far been observed on it in Malaya, with brief notes on their life-history, food-plants, and distribution.

The leaf-eating insects found on *Derris* are all Lepidoptera, viz., the Hesperid, *Hasora* (*Parata*) *alexis*, F.; the Arctiid, *Amsacta lactinea*, Cram., which has caused serious damage to chillies on one occasion; the Geometrid, *Anisodes obrinaria*, Guen.; a Psychid, *Mahasena* sp.; the Limacodid, *Belippa laleana*, Moore; the Thyridid, *Striglina scitaria*, Wlk.; the Pyralids, *Lamprosema diemenalis*, Guen., *Maruca testulalis*, Geyer, and *M. amboinalis*, Feld.; and the Eucosmids, *Eucosma balanoptycha*, Meyr., and *E. defensa*, Meyr.

Two Bostrychids, a Scolytid, and a Tenebrionid were found feeding on dried roots of *Derris*, in the adult and probably also in the larval stages. One of the Bostrychids appears to be a very serious pest, and was found to have destroyed almost the whole of a stock of stored *Derris* roots in one case. As heat affects the toxicity of *Derris* roots fumigation will probably be necessary against this pest; roots should be examined for infestation during storage. An extract made from the excreta of the dominant Bostrychid was found to possess no insecticidal properties.

STEINMANN (A.) & BERNARD (C.). **Le champignon entomophage des cochenilles de l'hévéa, *Hypocrella reineckiana*, P. Henn.**—*Arch. voor de Rubbercultuur in Nederlandsch-Indië*, Soerabaya, May 1925. (Abstract in *Bull. écon. Indochine*, xxviii, Renseignements, pp. 355–356, 2 refs. Hanoi, 30th September 1925.)

Hypocrella reineckiana, a fungus infesting the Coccids that attack *Hevea*, is recorded for the first time from the Dutch East Indies. Though it occurs on the lower surface of the leaves, it is in no way injurious to the plants.

BERNARD (C.) & STEINMANN (A.). **Lésions causées par les acariens sur les feuilles d'hévéa, à Java.**—*Arch. voor de Rubbercultuur in Nederlandsch-Indië*, Soerabaya, May 1925. (Abstract in *Bull. écon. Indochine*, xxviii, Renseignements, pp. 357–360, 1 pl., 2 refs. Hanoi, 30th September 1925.)

The mites recorded from *Hevea* in the Dutch East Indies are *Tetranychus telarius*, L., *Tarsonemus translucens*, Green, and an unidentified species described as the grey mite. The last named is responsible for an abnormally elongated appearance of the leaves. As a result of attack by *T. translucens*, the leaves are irregularly deformed. These mites disappear with the first rains, and the new leaves grow normally, so that the plants are not affected unless the mites occur in very large numbers or if they appear very soon after the dormant period of the trees and thus cause a large number of the young leaves to drop.

These mites can only be economically controlled in the nurseries, where they may be destroyed by collecting the infested leaves. Sulphur dusts are recommended, and colloidal sulphur emulsions might prove effective.

COMPERE (H.). **A New Genus and Species of Aphelinidae (Hymenoptera) from China.**—*Trans. American Ent. Soc.*, li, no. 2, pp. 129–134, 2 pls. Philadelphia, Pa., June 1925. [Recd. November 1925.]

Paraphytis vittata, gen. et sp. n., was reared from *Lepidosaphes tubulorum*, Ferris, infesting an unknown plant in China. It is uncertain whether it is a primary parasite or a hyperparasite.

MPBELL (A. S.). **Agromyzid Fly in Beans.**—*Lingnaam Agric. Rev.*, iii, no. 1, pp. 16–17. Canton, China, 19th October 1925.

3eans grown in Canton, especially string varieties and lima beans *iaseolus lunatus*], are heavily infested with *Agromyza phaseoli*, Coq., l large numbers of the plants die as a result of the feeding of the vae on the roots and stems. The pupae are generally buried in the ues inside the stem or attached outside or to soil particles not more n 1 in. under ground. The pupal stage occupies an average of 72 irs, the emerging flies reaching the air through broken parts of the m or through loose soil. Eggs are apparently laid in the plants, and larval stage lasts about five days. The damage at Canton is done efly in September and October, and is apparently confined to tivated plants. As eggs survive in the old stalks, the remedies gested are their careful destruction and rotation with crops not acked by the fly.

LKENSTEIN (R. B.). **A Preliminary Note on the Lychee Stink Bug (Heteroptera, Pentatomidae).**—*Lingnaam Agric. Rev.*, iii, no. 1, pp. 64–65. Canton, China, 19th October 1925.

The Pentatomid, *Tessaratoma papillosa*, Drur., which is widely tributed throughout the Orient, seems to confine its attacks in South na to the lychee (*Litchi chinensis*) and the lungan (*Euphoria longana*). iposition begins in late March or early May, is at its height in May i June, and continues into July ; the eggs hatch in 11 days, and the nature stages complete development in 5 to 8 weeks. The nymphs n begin to feed by inserting their rostra into the veins of the fresh ves or shoots, and the larger nymphs particularly attack the fruit ms at the time when the fruit is filling out, the resulting damage ng estimated to amount to a very large sum annually in China. The rwintering adults gradually die off during the summer, many being acked by a fungus of the *Pencillium luteum* group. They pass the iter congregated on the thick foliage of lychee or neighbouring trees. ds, with the exception of the Chinese bulbul (*Pycnonotus sinensis*), oid the bugs. During the winter season, clusters of the inactive ects can easily be collected by hand, as can also the eggs, but as the ilts are strong fliers, concerted action is necessary over large areas. ays would be difficult of application and have not as yet been tried. o Hymenopterous parasites, one a Chalcid, attack the eggs, the asitism sometimes amounting to as much as 44 to 75 per cent. in ne areas. It is proposed to propagate these parasites in the labora- y and also to make further studies of the fungus.

BERTSON (W. H.). **Report of Provincial Horticulturist and Inspector of Fruit Pests.**—*19th Ann. Rept. Brit. Columbia Dept. Agric, 1924*, pp. K19–K28, 2 pls. Victoria, B.C., 1925.

Eriophyes pyri may be satisfactorily controlled by lime-sulphur in utions as weak as 1 to 20, though the strength recommended is 1 15. The area subject to quarantine on account of infestation by *dia pomonella* is increasing each year. During 1924 1,244 acres were ayed, and an additional 877 acres were under quarantine regulations l subject to band inspections. It is impossible to eradicate this pest British Columbia, and if new areas of infestation develop as rapidly they have done in the past season, the present system of quarantine may have to be dropped. A small infestation of *Aspidiotus pernicio* occurred on apple and pear during 1924, which was to be treated oil sprays in the spring of 1925.

Lyne (W. H.). **Report of the Chief Inspector of Imported Fruit a Nursery Stock, Vancouver.**—*19th Ann. Rept. Brit. Colum Dept. Agric., 1924,* pp. K28–K32. Victoria, B.C., 1925.

Pests intercepted in British Columbia that have not been recen recorded [*R.A.E.*, A, ix, 13; xiii, 637] include *Anarsia lineatella* peaches, *Aspidiotus aurantii* and *Mytilaspis* sp. on oranges and gra fruit, *Pennisetia* (*Bembecia*) *marginata* in blackberry and raspbe canes, *Aristotelia* sp. in strawberry plants, an Aphid on roots of pea trees, and *Phylloxera* on roots of grape-vines from the United Stat *Cylas formicarius* in sweet potatoes from China; *Heliothis obsol* (*armigera*) on tomatos from Mexico; and *Diaspis* and *Chionaspis* ornamental shrubs from Europe and Japan.

Ruhmann (M. H.). **Report of Assistant Entomologist, Vernon.**—*19th Ann. Rept. Brit. Columbia Dept. Agric., 1924,* pp. K35–K Victoria, B.C., 1925.

The possibility of determining the general emergence of *Cydia pom nella*, L. (codling moth) from temperature records is considered i practical from the point of view of the average grower, as the relati humidity has a marked bearing on it, and therefore humidity readir would also have to be taken and comparative tables constructed. F the grower the best method of determining the time of emergence to collect about 100 mature larvae in the autumn and place them in breeding-cage in a well protected part of the orchard. As soon the general emergence of the adults from these larvae is noticed in t spring, the trees should be well covered with an arsenical spray.

For the control of the onion maggot [*Hylemyia antiqua*, Meig.], thr applications of mercury bichloride at intervals of 10 days reduced t infestation by about 95 per cent. It is important that the entire cr be treated within three days after oviposition begins, the strength recom mended being 1 oz. mercury bichloride to 10 gals. water. In the experiments a 4-gallon tank was used, to which straps were attach similar to those of a knapsack sprayer. Near the bottom of the tan on the right side, a short brass tube (¼ in. diameter) was soldered c and to it a length of rubber tubing was fastened. This tube was lo enough to reach the ground when the tank was carried on the bac and its position was regulated by a handle made of thick wire abo 2½ feet long. The total cost of this treatment per acre was about £3

Watson (J. R.). **Another Year of the Citrus Aphis.**—*Flori Ent.*, ix, nos. 1 & 2, pp. 9–13 & 26–28. Gainesville, Fla., Mar & August 1925.

An outbreak of *Empusa* and climatic conditions contributed towar keeping down the numbers of *Aphis pomi*, DeG. (*spiraecola*, Patch) *Citrus* in Florida in 1925. In the opinion of growers the infestati was somewhat less than in the previous year, though the severe infested area was so much more extensive that the total damage do has been much greater. The fruit crop has been greatly reduced, a the crop to be harvested 1926-27 will also suffer as a result of the dama done to the young shoots in the spring of 1925. The Aphids do m mage in the early stages of the flush growth of *Citrus*, so that remedial asures should be applied at this time. After the petals drop, most the Aphids attack the calyx rather than the young oranges ; and ugh sufficient numbers may attack the fruit to roughen it severely, oranges largely outgrow this injury. The most satisfactory asures under all weather conditions are dipping the small trees branches of which can be bent over into a bucket, and fumigation ler tents. For dipping, a solution of derris-oil, 1 table-spoonful 1 U.S. gal. of water, is recommended, or the same amount of otine sulphate plus 1 oz. or less of soap. More soap may cause rching. For fumigation, calcium cyanide in dust form has been d successfully, also a 3 per cent. nicotine sulphate and lime dust. e latter is not effective during rain or cold, cloudy weather. An osure of 5 minutes is sufficient, though half a day does no harm. ese dusts also kill rust mites [*Phyllocoptes oleivorus*, Ashm.] and cid larvae, but red spiders require a longer exposure. Various forms tents for trees of different sizes are described.

Spraying may be effective if thoroughly done before the Aphids have led the leaves. Oil emulsions, lime-sulphur, and soap sprays are isfactory, their efficacy being increased by the addition of nicotine phate. By spraying it is possible to combine the control of Aphids h that of whitefly, scale, thrips, and mites.

o prevent future outbreaks every effort should be made to bring trees into a state of complete dormancy in the late autumn, about vember in most sections, and to ensure that they are free from Aphids the first of February. All Aphids observed during December and uary should be destroyed, and it would probably be well to cut off sprouts that may start on young trees. In the spring the growth the trees should be accelerated as much as possible, so as to produce ood crop of foliage before the Aphids become numerous. Other d-plants of *A. pomi* such as *Chenopodium* sp. and *Erechtites hieracifolia* uld be destroyed before applying remedial measures.

A Coccinellid, *Leis* sp., has been received from California and is a acious feeder on *A. pomi*. At least in one locality a full generation been completed in the field, so that this predator can live out of ors in Florida. It is also apparently less subject to fungous and terial diseases than the blood-red lady-beetle [*Cycloneda sanguinea*], ich is the most common native species.

RTER (W.). **The Effect of Low Temperatures on** *Bruchus obtectus*, **Say, an Insect affecting Seed.**—*Jl. Agric. Res.*, xxxi, no. 2, pp. 165–182, 6 figs., 18 refs. Washington, D.C., September 1925.

The following is taken from the author's summary and conclusions :—

uchus obtectus, Say, the common bean Bruchid, has been used for periments on supercooling and resistance to low temperatures. ough Bakhmet'ev in 1907 stated that an insect's temperature must lowered again to its supercooling point after a rebound has taken ce, before death ensues, subsequent work shows that an insect is led if a rebound occurs. A rebound is evidence that heat of ystallisation is given off. Crystallisation of the lymph is believed to responsible for the death of the insect. Active adults withstood mperatures of —10° C. [14° F.], a temperature below the average percooling point, for a period of three hours. The exact freezing int of *B. obtectus* cannot be obtained with present day electrothermal ethods. There is a distinct correlation between the supercooling point and the rebound point, but this is believed to be due to radiatio from the insect to the air of the cooling chamber. There appears t be no correlation between the supercooling and the rate at which th insect has cooled. The capacity of *B. obtectus* to resist low temperatur is limited by the length of time it can remain in the supercoole condition. This capacity varies with the stage, active adults being lea resistant and eggs most resistant. Temperatures of below −10° C [14° F.] for a period of 12 hours are fatal to all stages of this beetl Its growth in beans can be materially retarded by storage in temperatures even as high as 64° F. A difference of less than 10° F. almo doubles the length of a complete life-cycle, so that, even in the Sout development of the insect could be retarded considerably until fata outdoor temperatures prevailed.

CAUDELL (A. N.). *Pycnoscelus surinamensis* **Linnaeus (Orthoptera) on its Nymphs and the Damage it does to Rose Bushes.**—*Pro Ent. Soc. Washington*, xxvii, no. 8, pp. 154–157, 2 figs., 2 ref Washington, D.C., November 1925.

Since the first record of the Blattid, *Pycnoscelus surinamensis*, L., as a pest in greenhouses [*R.A.E.*, A, vi, 460], a number of simila instances have been noted. During 1924 it occurred on Rhode Islan where rose bushes were destroyed, especially the young plants, as result of injury to the bark of the stems about two inches below th surface of the ground. All the damage so far reported has been don in greenhouses, but in the Southern States there is apparently no reaso why this pest should not also cause serious damage out of door Rearing experiments have proved it to be parthenogenetic, and all th nymphs reared to maturity so far have been females.

GAHAN (A. B.). **A New Encyrtid parasitic in the Eggs of** *Moneilem* **(Hymenoptera : Chalcidoidea).**—*Proc. Ent. Soc. Washingto*, xxvii, no. 8, pp. 167–168. Washington, D. C., November 1925.

Ooencyrtus moneilemae, sp. n., is an egg-parasite of a Longicor beetle, *Moneilema* sp., and has been reared in connection with th prickly-pear insect investigations being carried out by the Commonwealth of Australia in Texas.

Report of the Virgin Islands Agricultural Experiment Station 1924.—*Virgin Is. Agric. Expt. Sta.*, 19 pp., 5 figs. Washington, D.C. July 1925. [Received November 1925.]

In the report of the horticulturist, W. M. Perry, lead arsenate an Bordeaux mixture (4 : 4 : 50) are recommended for the control o *Diaphania hyalinata* (melon worm) ; kerosene emulsion against *Aphi gossypii* (melon aphis) ; and poison baits, consisting of ripe tomato into which mercury bichloride has been injected, for the control o *Phthia picta*. These three insects do considerable damage to cucurbits particularly melons. *Citrus* trees were heavily infested with *Lepidosaphes beckii*, but were effectively sprayed with a lubricating oi emulsion.

In the report of the agronomist, M. S. Baker, it is stated that in spit of the close season for cotton of nearly two years, the crop of 1923 wa practically destroyed by *Platyedra* (*Pectinophora*) *gossypiella*. Though the seed was imported from Barbados, where it had been fumigated, i apparently contained living larvae at the time of its introduction.

ITHYCOMBE (C. L.). **A Trinidad Cotton Pest.**—*Trop. Agriculture,* ii, no. 12, pp. 286–287. St. Augustine, Trinidad, December 1925.

The eggs of the Noctuid, *Sacadodes pyralis,* Dyar, commonly known Trinidad as the Trinidad bollworm, are laid singly on the leaves, lls, stems, etc., of the cotton plant, but generally at the bases of the lls where protected by the bracts. After about a week, the pinkish-loured larva hatches, makes its way to a boll or flower-bud and gins to bore into the interior. If the boll is a well-grown one, the va generally remains there ; otherwise several may be attacked in rn. The result of attack is that the seeds are destroyed and the lint ined. After a few weeks the larva descends to the ground and pates near the surface, but it occasionally remains at the base of a ll, drawing the bracts around itself and securing them with silken ands. The pupal stage lasts from 2 to 4 weeks, when the adult nerges and the life-cycle recommences. Cotton seems to be the eferred food-plant, though the author has once obtained a larva from *ibiscus sabdariffa* and once from *H. esculentus* (okra). During most of e wet season, when few bolls are available, the larvae are rarely und ; they begin to appear in late October or November and increase numbers during the dry season. On perennial cottons the number infested bolls sometimes reaches 60 or 70 per cent. The larvae are casionally parasitised by a Braconid, and, after leaving the bolls for pation, they are sometimes attacked by a predacious Pentatomid g. The only recommendations that can be made at present for eping down the numbers of this pest are the elimination of outside eeding-grounds and the cleaning up of cotton after the crop. rennial cottons in particular require attention, at least during a close ason.

EETE (C. C.). **The Cotton Industry ; Entomological Work.**—*Rept. Dept. Agric. Barbados, 1924–25,* pp. 5–6 & 9–10. Barbados, 1925.

The situation with regard to *Diaprepes abbreviatus,* L., and *Lachno-rna smithi,* Arr., attacking sugar-cane remains unchanged [*R.A.E.,* xii, 407]. *Diatraea saccharalis,* F., appears to have done more amage than usual in some districts. *Platyedra* (*Pectinophora*) *gossy-ella,* Saund., occurs in almost all the cotton-growing districts of the land, and efforts are being made to prevent its further spread by forcing legislation. *Alabama argillacea,* Guen., should be controlled y dusting with Paris green. Infestations of *Aphis gossypii,* Glov., ere rapidly reduced by parasites.

The more important Coccids from various food-plants are *Selenaspidus ticulatus,* Morg., *Lepidosaphes beckii,* Newm., *Coccus viridis,* Green, d *C. hesperidum.* L. Satisfactory results have been obtained with lb. whale oil soap completely dissolved in 1¾ pints fusel oil, and then lded to 14 pints kerosene oil. This must be stirred until thoroughly nulsified ; it then forms a stock solution, which must be diluted ith 15 times the amount of water for spraying.

HRHORN (E. M.). **Reports of the Chief Plant Inspector, February-July 1925.**—*Hawaiian Forester & Agric.,* xxii, no. 3, pp. 96–101. Honolulu, July–September 1925.

The pests intercepted during the period under review included :—rom California, *Chrysobothris femorata* in a fruit tree, *Myzus circumflexa* on gladiolus bulbs, *Macrosiphum solanifolii* on vegetables, *Pseudococcus maritimus* and *Taeniothrips inconsequens* on deciduous fruit, *P. citr* and *Orthezia insignis* in a basket of plants in soil, Lepidopterous larvae probably of *Aegeria rutilans*, in a raspberry plant, *Pantomorus godman* (*fulleri*) in soil, *Phorbia planipalpis* in radish, *Aphis rumicis* (*euonymi*), on ornamental plants, and a cricket, *Stenoplematus irregularis* in packing of *Dahlia* bulbs; from Washington, *Merodon equestris* in narcissus bulbs; from Pennsylvania, an apterous Aphid on iris root; from New Jersey, *Coccus* (*Lecanium*) *pseudohesperidum* on orchids; from New York *Pseudococcus adonidum* (*longispinus*) on ornamental plants; from the Philippines, *Aspidiotus harti* on ginger, *Bruchus chinensis* in dry beans, *Tribolium castaneum* (*ferrugineum*) in a package of cakes, *Pseudococcus lilacinus* on citron, and *Araecerus* (*Araeocerus*) *fasciculatus* in beans from Tahiti, *Aspidiotus* sp. and *Lepidosaphes beckii* on citrus budwood *Aspidiotus* sp. and *Lecanium* sp. on pumpkins, and *Euscepes batata* in sweet potatoes; from the Cook Islands, a mealybug on yam and Lepidopterous larvae on Jerusalem artichokes; from Japan, *Bruchus pisorum* in dried peas, and *Parlatoria pergandei* and *Pseudococcus* sp. on sand-pears [*Pyrus sinensis*]; from China, *Parlatoria pergandei* on oranges, *Pseudococcus* sp. on orchids, and *Cylas formicarius* in sweet potatoes; and from Australia, *Saissetia* sp. in soil.

Blake (E. G.). **Enemies of Timber: Dry Rot and the Death-watch Beetle.**—8vo, xvii+206 pp., 10 pls., 12 figs. London, Chapman & Hall, Ltd., 1925. Price 12*s*. 6*d*. net.

In his preface the author draws attention to the fact that the world's consumption of timber is greatly in excess of the provision made for the future by the planting of timber-trees, so that the prevention of waste by preservation from decay and the ravages of insects and fungi is of the greatest importance. Quite apart from the question of waste is the often unrealised danger of the collapse of timber structures owing to infestation by dry-rot or wood-boring beetles.

The first part of the book deals with dry-rot, a fungous disease mainly caused, in Britain, by *Merulius lachrymans*; the second part (92 pages) deals with the common furniture beetle, *Anobium punctatum*, and the death-watch beetle, *Xestobium rufovillosum* (*tessellatum*). The life-histories of these two insects in Britain are given, and the methods to be employed for their control are described. Most of the control measures suggested for *A. punctatum* have already been noticed [*R.A.E.*, A, viii, 443; xiii, 294]. Emphasis is laid on the necessity for immediate action in cases of infestation by the beetles, and for exercising the greatest care in preventing the infestation of a building by the introduction of wood containing their eggs or larvae. The application of creosote to timber under high pressure, before using it, is a highly effective means both of treating and preventing infestation, provided that the nature and function of the timber is not such as to preclude the use of this substance. In discussing the various liquids that have been used for the destruction of *X. rufovillosum* in structural timbers, the author gives the formula devised by H. M. Lefroy, which was used in the later stages of the work in Westminster Hall. The formula is as follows:—Dichlorobenzene 50 per cent., mineral oil 47 per cent., barium oleate 3 per cent. The mineral oil used is a refined thick oil, and acts as the vehicle for the volatile poison, dichlorobenzene, while the barium oleate, which is harmless to human beings, but highly toxic to insects, prevents future infestation by coating the wood with a thin film that acts as a repellent to the adult beetles.

Pope (W. T.). **Report of the Horticultural Division.**—*Rept. Hawaii Agric. Expt. Sta., 1924*, pp. 4–10, 4 figs. Washington, D.C., July 1925.

The work of the year included successful investigations on the control of three pests of the avocado, *Pseudococcus nipae* (avocado mealybug), a Scolytid, *Xyleborus immaturus*, and the larvae of a Tortricid, *Amorbia emigratella*. *Adoretus sinicus* (*tenuimaculatus*) (Japanese beetle) is probably the only serious pest of grapes in Hawaii ; it feeds on the foliage and shows a decided preference for certain varieties. *Cryptorhynchus mangiferae* (mango weevil) was troublesome in some localities ; it enters the husk of the mango seed in its early stages of growth and causes the fruit to fall before it is ripe.

Beamish (E. H.). **Control of Grain-weevil : A Farmer's Experience.**—*N.Z. Jl. Agriculture*, xxxi, no. 3, p. 207. Wellington, 21st September 1925.

Barley in a stable-loft was found to be much more heavily infested with grain-weevils [*Calandra*] than oats stored with it. A large proportion of the weevils present were killed by fumigation with sulphur, which was repeated five times, after stopping up all crevices with paper. Kerosene emulsion, sprayed with a force-pump over the inside of the building, when empty, killed all the weevils with which it came in contact, and this, repeated at intervals, eventually destroyed them all. It was found that weevils can exist in a building, either as mature insects or in the egg stage, for nine months, even with apparently no immediate access to food for at least part of that time.

Burns (A. N.) & Mungomery (R. W.). **Investigation of [Sugar-cane] Pests and Diseases.**—*Queensland Agric. Jl.*, xxiv, pt. 4, pp. 334–336. Brisbane, 1st October 1925.

The larvae of the Noctuids, *Cirphis unipuncta*, Haw., and *C. loreyi*, Dup. (army worms) are destructive to the leaves and young shoots of sugar-cane in Queensland and other tropical countries. They feed mainly at night, sheltering during the day in the curled leaves, in the central whorl, or under débris or clods of earth at the base of the plants. They pupate in the soil, about 2-3 inches below the surface, and the moths emerge in 2–3 weeks, according to the season. Young cane plants are sometimes completely destroyed. Although *C. unipuncta* is usually the more abundant in Queensland, in 1925 *C. loreyi* predominated in the northern districts. Parasites recently bred from the larvae of both moths were 2 Tachinids, 1 Chalcid, 1 Braconid, and the Ichneumonid, *Henicospilus skeltoni*, Kby.

In one district a serious increase in the infestation by *Rhabdocnemis obscura*, Boisd. (sugar-cane borer) was caused by allowing extensive cane fields to remain unharvested for several years, and by allowing a crop accidentally burnt to remain on the ground, thus providing suitable breeding-places for the weevils. In order to prevent the spread of this pest to fresh areas, care should be taken to collect any cane that may fall from trucks in transporting it from the field to the mill, sometimes over considerable distances. Care should also be exercised in the selection of uninfested cane in planting new fields. The cane-leaf mid-rib moth-borer (*Cosmopteryx* sp.) is a sugar-cane pest of minor

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importance, but of frequent occurrence. The larvae tunnel in the midribs of the leaves, and pupate in the tunnels. The pupal period lasts about one month (in September), and the adults emerge through exit holes prepared by the larvae prior to pupation.

Newman (L. J.). **Codlin Moth** (*Carpocapsa pomonella*).—*Jl. Dept. Agric. Western Australia,* ii, no. 3, pp. 340–345, 8 figs. Perth, September 1925.

An outbreak of *Cydia* (*Carpocapsa*) *pomonella* is recorded from Western Australia. If all the legislation concerning it is strictly adhered to and remedial measures, such as collection of the pest by means of sticky bands and spraying with lead arsenate, are thoroughly and systematically carried out, this outbreak should be exterminated as have been similar ones in the past.

Newman (L. J.). **The Red Legged Earth Mite.**—*Jl. Dept. Agric. Western Australia,* ii, no. 3, p. 354. Perth, September 1925.

The red-legged earth mite [*Notophallus bicolor*, Frogg.] [*R.A.E.*, A, xi, 571] has spread throughout the south-west, causing great damage to gardens and field crops during the winter months. The period from October to May is passed in the egg stage. The eggs are lodged in the soil or blown about on the surface of the ground, being very resistant to heat and desiccation. The mites may be controlled by a combined dust and fertiliser consisting of 1 lb. of 15 per cent. carbolic powder to 3 lb. superphosphate of lime. This is purely a contact insecticide, and must be applied when the mites are on the leaves, the best time being between 11 a.m. and sunset on a dry day. As the eggs are not killed, a second application should be made after an interval of 8 to 10 days. At least 1 cwt. of mixture should be used per acre. If the manure basis is not desired, lime, tobacco dust, or any inert dust may be used in the same proportions.

Newman (L. J.) & Clark (J.). **The Jarrah Leaf Miner** (*Tinea* **sp.**).—*Jl. Dept. Agric. Western Australia,* ii, no. 3, pp. 372–378, 8 figs. Perth, September 1925.

The Tineid recorded from jarrah (*Eucalyptus marginata*) and other species of *Eucalyptus* [*R.A.E.*, A, xiii, 456] is apparently an undescribed species of *Tinea.* The damage done by this leaf-miner is temporary so far as the leaves are concerned ; the exact effect on the tree has not been determined. The eggs are deposited within the leaves during May and June, which is the dormant period for *Eucalyptus*, and as the larvae do not travel from leaf to leaf, any foliage put forth after this time is not affected. There is only one generation a year, the larval period lasting from May to September. As the larvae feed entirely within the mine, contact sprays and poisons are useless. When the larvae bury themselves in the soil, they may be destroyed in large numbers by burning over the ground, where this is possible without damage to young seedlings and growing trees. No parasites have been reared from this pest.

NEWMAN (L. J.). **Winter Trapping of Fruit-fly** (*Ceratitis capitata*).—*Jl. Dept. Agric. Western Australia*, ii, no. 3, p. 383. Perth, September 1925.

A series of experiments made from 5th May to 31st August, covering a normal winter, have shown that *Ceratitis capitata* does not hibernate in the true sense of the word in Western Australia. The different stages in the life-history are protracted, but not sufficiently so to amount to hibernation. The climate is mild enough to allow a winter brood to be reared. The resulting adults are dependent for oviposition on winter fruits such as loquats, oranges, etc. In all fine periods during the winter season traps and bait-sprays should be employed.

CHANDLER (L. G.). **Habits of the Sand-wasp.**—*Vict. Nat.*, xlii, no. 5, pp. 107–114. Melbourne, September 1925.

The sand wasp, *Ammophila suspiciosa*, is recorded as a useful enemy of cutworms infesting vines and wheat.

GARDNER (R.). **Onions and Parsley.**—*Gardeners' Chron.*, lxxviii, no. 2031, p. 435. London, 28th November 1925.

Sowing parsley or other aromatic plants among onions, or sowing broad beans on either side of them is said to be a successful method of preventing oviposition by the onion fly [*Hylemyia antiqua*].

COPLEY (G. H.). **The Destruction of White Fly.**—*Gardeners' Chron.*, lxxviii, no. 2034, p. 488. London, 19th December 1925.

To control whitefly [*Trialeurodes vaporariorum*] in greenhouses fumigation with tetrachlorethane is advised, 2½ oz. poured on the path being sufficient to fumigate 1,000 cu. ft. This should be repeated three times at intervals of a week on a calm evening and in a dry atmosphere.

METCALFE (J. W.). *Gracilaria azaleella* **Brants in Devon : a Greenhouse Pest.**—*Entomologist*, lix, no. 752, p. 13. London, January 1926.

Gracilaria azaleella, Brants, is apparently recorded for the first time from England. It has been found causing considerable injury to azaleas in greenhouses at Torquay. The broods appear to be continuous under glass. Unfortunately, a number of the infested plants have already been distributed.

MASSEE (A. M.). **Entomology. Programme of Research with Brief Progress Reports.**—*Ann. Rept. East Malling Res. Sta. 1924*, pp. 139–142. East Malling, Kent, November 1925.

Most of the investigations here reported on have been or will be dealt with more fully elsewhere. A new gall mite, *Phyllocoptes masseei*, Nal., has been found on black currant and may prove to be of considerable economic importance. *Eriophyes gracilis*, Nal. (leaf and bud mite of raspberry) has occurred commonly in raspberry plantations, and is being investigated. The insect fauna of raspberries has been studied in connection with the transmission of mosaic disease, but no positive results have been obtained in transmission experiments with insects.

Massee (A. M.). **The Control of the Apple Blossom Weevil** (*Anthonomus pomorum* **L., Curt.**)—*Ann. Rept. East Malling Res. Sta. 1924*, pp. 145–157, 1 pl., 9 refs. East Malling, Kent, November 1925.

This paper has already been noticed from another source [*R.A.E.*, A, xiii, 60].

Hatton (R. G.), Amos (J.) & Tydeman (H. M.). **The Control of Big Bud Mite in the Field.**—*Ann. Rept. East Malling Res. Sta. 1924*, pp. 158–164, 1 pl., 2 refs. East Malling, Kent, November 1925.

Investigations on the control of *Eriophyes ribis*, Nal. (big bud mite) on black currants [*R.A.E.*, A, xii, 505] were continued in 1924. Spraying with lime-sulphur again gave the most satisfactory results and very greatly reduced the rate of spread of the big bud infection, as shown by comparison with the control bushes. The crop produced by each bush does not seem to be materially affected by either spraying with lime-sulphur or hand-picking the buds, but it was seriously reduced by the cutting down of alternate bushes in alternate years, a system that failed to give any appreciable control of big bud. The best time for spraying with lime-sulphur is when the flower racemes have appeared, but before the flowers have opened ; this is about 10–14 days later than the time recommended by A. H. Lees [*R.A.E.*, A, viii, 350]. The spray kills the mites as soon as they begin to migrate from the buds in which they have passed the winter. It has been found that buds in which mites have passed the winter have occasionally remained normal in size ; this fact accounts for the failure to obtain complete control by hand-picking of big buds, and suggests that this operation should be carried out as late as possible before the opening of the buds, as the number of enlarged buds increases slightly in the course of the winter. Lime-sulphur generally causes slight scorching of the young leaves, but no permanent damage seems to result. It appears that spraying with lime-sulphur and hand-picking of big buds had a definite effect in checking the spread of "reversion" during 1924, as the number of new cases on the plots thus treated amounted only to 4 and 5 per cent. respectively, against 23 per cent. on the control plots.

Massee (A. M.). **Specimens and Pests received during the Year.**—*Ann. Rept. East Malling Res. Sta. 1924*, pp. 165–166. East Malling, Kent, November 1925.

Drooping and falling off of black currant leaves reported from several parts of the country was found to be due to attacks of *Otiorrhynchus picipes*, F. (clay-coloured weevil). The adults rest in the soil during the day and feed on the petioles, leaves, and young shoots at night. The petioles may be completely or partly eaten through, with the result that the leaves fall or wither. Young or newly planted bushes are particularly liable to attack, and are sometimes defoliated.

The Oribatid, *Euzetes lapidarius*, Michael (beetle mite) was very plentiful in 1924. Hibernation takes place in the adult stage, among moss and lichen, and the eggs are laid in very large masses on fruit trees. The mites are usually considered to be beneficial, as they feed on fungus spores and lichen, but several cases were reported in which fruit-stalks and fruits of cherries were infested by them, with the result that the crops were ruined.

CHOPRA (R. L.). **On the Structure, Life-history, Economic Importance and Distribution of the Cocksfoot Moth,** *Glyphipteryx fischeriella,* **Zell.**—*Ann. App. Biol.*, xii, no. 3, pp. 359–397, 21 figs., 18 refs. Cambridge, July 1925. [Recd. December 1925.]

Considerable damage has been caused by *Glyphipteryx fischeriella,* Zell., to cocksfoot grass (*Dactylis glomerata*) grown experimentally as a temporary grass ley at the Welsh Plant Breeding Station, Aberystwyth. All stages of the moth are fully described and illustrated. The adults appear at the end of May; they are diurnal and are most active on bright days, but are not attracted by artificial light. They possess moderate powers of flight, the females being the stronger fliers. The female lays 25–30 eggs, singly, at the base of the seeds. The eggs are laid about the middle of June, and hatch in 10 to 15 days. The larva, on hatching, burrows into the seed and closes the entrance hole with a web of silk. When it has completely eaten the seed, it emerges by the entrance hole and attacks another one; it becomes full fed in 3 or 4 weeks, and generally emerges from the seed, and spins a cocoon between the seeds, or in some convenient place away from the food-plant. After completing the cocoon the larva moults for the fourth time, and hibernates; in the following April or May it makes a hole in the cocoon and pupates, usually outside, but sometimes inside it. Some of the larvae hibernate in the hollowed-out seeds; in this case they do not spin a cocoon, but merely block the entrance hole with a pad of silk. The pupal stage lasts 3 or 4 weeks.

The extent of infestation by *G. fischeriella* varied considerably according to the variety of cocksfoot. Plants grown from seed of American, French, Danish, Swedish, and indigenous origin were grown together and under similar conditions; of the American, French and Danish strains the average number of seeds damaged did not exceed 2⅓ per cent., while 10 per cent. and 20 per cent. of the seeds of the Swedish and indigenous strains, respectively, were damaged. The time of flowering of the various strains does not seem to affect the degree of infestation, nor is any selection made by the larvae, as very few eggs are laid on the relatively immune plants. It appears, therefore, that selection is made by the moth in ovipositing, reacting to physiological differences in the strains, and perhaps also, to some extent, to the colour of the panicle, which usually has a bluish tinge in the indigenous plants during flowering, while the foreign strains are green; the colour factor is, however, uncertain. Wild cocksfoot grass from many parts of Wales was found to be very heavily infested, about 30 per cent. of the seeds being damaged; this is probably due to the more favourable conditions of the wild habitats.

In breeding *G. fischeriella* no parasites were reared. Clean cultivation, consisting of the removal of weeds in and around fields, should give some degree of control, by depriving the insect of suitable hibernating places and shelter for the adults. Larvae in the seeds can be killed by subjecting them to a temperature of 140° F. (60° C.) for 24 hours in an airtight chamber; this does not affect the germination of the seed.

WILLAUME (F.). **Esquisse d'un plan de sélection rationnelle des produits insecticides et fongicides commerciaux.**—*Rev. Path. vég. & Ent. agric.*, xii, no. 3, pp. 207–224, 5 refs. Paris, July–September 1925. [Recd. December 1925.]

The necessity for regulating the sale of insecticides and fungicides is recognised throughout the world, and in this paper a scheme is suggested by which, under the supervision of an official phytopathologist, local bodies would effect the necessary control. It is hoped that the French Ministry of Agriculture will sign a decree for the suppression of insecticides or fungicides with secret formulae, and give administrative authority on the lines suggested. An account is added, by E. Foex, of the discussion that took place at the International Phytopathological Congress at Wageningen in 1923, regarding the measures requisite for establishing the value of insecticides and fungicides.

WILLAUME (F.). **Contribution à l'étude des Bouillies insecticides à base d'huiles insolubles.**—*Rev. Path. vég. & Ent. agric.*, xii, no. 3, pp. 225–247, 18 refs. Paris, July–September 1925. [Recd. December 1925.]

Insecticidal sprays containing mineral oils have proved very successful against Coccids on fruit trees, and can be manufactured on the spot. The author explains the methods of preparation that have given the best results, and discusses certain new methods arising from the study of these processes, which will increase the very restricted number of practical formulae. For a good emulsion, it is necessary to use soluble or pseudo-soluble emulsifiers, or insoluble ones, provided that they consist of fine powder, the rôle of any of these being to isolate the globules of oil. The author considers that, in the first case, a sufficient suspension (comparable to the average Bordeaux mixture) depends on the density of the oil approximating to that of the emulsifier; while in the second case, on the other hand, it is the electrical charge of the periglobular covering that overcomes the factor of the density of the globule. With regard to application, in the case of sprays obtained with soluble emulsifiers, the loss in efficiency resulting from the addition of the emulsifier discussed by other investigators [*R.A.E.*, A, xiii, 343] can be overcome by applying the spray direct, at close range and under high pressure, the emulsion breaking upon contact with the object. Sprays containing insoluble emulsifiers can be used in the form of fine spray, the emulsion breaking more easily than in the others. Generally speaking, they do not require quite such accurate measuring of the ingredients; they are, of course, rougher, and require a slight shaking up in the sprayer. The author considers that this type of emulsion is worthy of the greatest consideration from a practical point of view, and will facilitate and popularise the use of insoluble oils.

Details are given regarding three of the known sprays, the properties of which are explained and their value discussed. The author has established some new formulae as a result of his studies, using anthracene oil as the insecticidal principle in most of them. In testing soluble or pseudo-soluble emulsifiers, negative results were obtained with gelatine, soap, sodium carbonate and alkaline substances in general, while saponin and gum arabic were positive. The following formula was therefore used: 3 gals. 90° alcohol with ½ lb. saponin are mixed together and thoroughly stirred in with a mixture of 1½ gals.

paraffin and 3½ gals. anthracene oil. Before use, this is diluted with 13 times its own volume of water, very gradually, stirring vigorously all the time. A variation of this formula is to emulsify a mixture of 1 gal. paraffin, 3½ gals. anthracene oil and 3 gals. alcohol in a solution of 15 lb. gum arabic in 15 gals. water, adding water up to 100 gals. in all. A drawback to the use of these emulsions is that, although efficacious (the alcohol renders them useful against the woolly aphis [*Eriosoma lanigerum*, Hausm.] and the latter has given much success as a wash against a maple Aphid, *Chaitophorus* sp.), they must be used in the dormant period of vegetation, and therefore cannot be combined with the spring fungicidal sprays. Another disadvantage of both sprays is the inconstant relation of the densities of the emulsified substance and the emulsifier.

Among insoluble emulsifiers, many substances in powder form, including flowers of sulphur, sulphur and lime, talc, precipitated phosphate, calcium cyanamide, graphite and calcium sulphate were all useless. A modification of Trabut's formula, made of 5 gals. paraffin and 40 lb. flour to 100 gals. water is useful when anthracene oil cannot be obtained, and is simple and cheap; the emulsion is unstable, but can be maintained by shaking. Greater effect is obtained with a mixture of 1½ gals. anthracene oil and 3½ gals. paraffin stirred in with 20 lb. flour made into a paste and the whole brought up to 50 to 100 gals. with water. An emulsion of 6½ gals. anthracene oil and 3½ gals. paraffin added to 20 lb. kaolin and water, and brought up to 100 to 200 gals. with water is cheap and easy to prepare and does not readily separate like the preceding one. A formula consisting of 6 gals. anthracene oil and 4 gals. paraffin emulsified with 20 lb. calcium sulphide and water and brought up to 100 to 200 gals. with water gives a less stable emulsion, but the calcium sulphide strengthens the action of the oil; its effect on the tree remains to be discovered. One of the best emulsions is obtained with 6½ gals. anthracene oil and 3½ gals. paraffin mixed with 20 lb. calcium arsenate in water, and brought up to 100 to 200 gals. with water; this is simple and cheap and would probably prove to be one of the best insecticides. The same may be said of a formula consisting of 10 gals. anthracene oil in 40 lb. calcium arsenate and 100 gals. water; in this case the anthracene oil is pure, but the amount of arsenic used might prove dangerous. In all these formulae, 1 per cent. of alcohol should be added if *E. lanigerum* is present on the trees.

PAILLOT (A.). **La Lyda du Pêcher. Etude biologique. Méthodes de destruction.**—*Ann. Epiphyties*, x, nos. 3 & 4, pp. 148–253, 7 pls., 59 figs., 1 map, 8 refs. Paris, 1924. [Recd. December 1925.]

A study has been made during recent years of the sawfly, *Neurotoma nemoralis*, L., in the Loire district. Outbreaks of this pest are comparatively rare and limited in area, but are generally intense. Peaches and almonds are the preferred food-plants; apricots are also seriously attacked, but on cherries the damage done is not usually important. Much of the information has already been noticed [*R.A.E.*, A, x, 141, 537; xi, 529; xii, 38, 254]. The fact that there are hibernating larvae in the ground practically all the year round makes the species difficult to deal with, and soil disinfection with carbon bisulphide has proved quite ineffective. The only practicable remedies are those directed against the larvae while above ground, or against the eggs, and these can only be applied during April, May and early June. During their period above ground the larvae are, however, extremely susceptible to insecticides, particularly nicotine and lead arsenate. Either diplumbic or triplumbic lead arsenate can be applied; the former is decidedly more toxic to insects in general than the latter; the maximum dose used should be 5 lb. commercial diplumbic arsenate (a thin paste), or 4 lb. commercial triplumbic arsenate per 100 gals. of spray. The addition of ½ lb. casein per 100 gals. increased the effectiveness of the treatment. The trees should be sprayed shortly before the time fixed by law, that is, at the latest, 5 weeks after blossoming. This will avoid injury to the foliage.

TROUVELOT (B.). **Cage pour la culture de plantes et l'élevage d'insectes au laboratoire : Cage dite "verticale."**—*Ann. Epiphyties*, x, no. 4, pp. 255–260, 2 pls., 2 figs. Paris, 1924. [Recd. December 1925.]

A cage is described that is useful for the rearing and observation of plants and also of their insect pests. It consists of a light wooden frame, roughly 10 in. by 10 in. by 30 in. high, the sides being partly of sliding glass panels and partly of muslin fitted with sleeves. The base is supported by its four corners on the edge of a flower-pot (the diameter of which should be about 12 in.) and into the base fits an inner wooden frame fitted with four zinc plates that pass straight down into the soil of the pot to a depth of about 3 in. The advantages of this cage are that it gives the maximum of light and maintains a constant humidity, the plants only requiring water once a fortnight in winter and every 5 to 7 days in summer, and needing very little attention.

[KOLOSOV (Yu. M.)] **Колосов (Ю. М.). Initial Information on the Biology of the more important Bark-beetles of the Ural and Siberia.** [*In Russian.*]—12 pp. Ekaterinburg, "Uralnarkomzem," 1923. [Recd. January 1926.]

This information is intended to assist in the collection of bark-beetles and is arranged in the form of a table containing 84 species. The favourite food-plants are indicated, as well as the position that the species occupies in the tree and the time of year when the adults may be expected. The importance of proper forestry methods for the control of these pests is pointed out, and their seasonal application for local conditions is briefly outlined.

[MEGALOV (A.).] **Мегалов (А.). Bulletins on Pest Control.** [*In Russian.*]—Saratovskoe Gubernskoe Zemel'noe Upravlenīe, Stantzīya zashchītui rastenīĭ ot vredīteleĭ S.–Kh. [*Saratov Plant Protect. Sta.*], numerous figs. Saratov, 1923–1925.

Of these four bulletins two are concerned with the life-history and control of *Euxoa segetum*, Schiff., and *Loxostege sticticalis*, L., respectively, and the third with various pests of the kitchen garden, the popular names only being mentioned. The fourth is more comprehensive (47 pages), and besides giving a general account of insect depredations, it deals with some 19 orchard pests, giving both their scientific and popular names. The remedial measures are dealt with under each pest and the work for each month is outlined.

Leaflets. [*In Russian.*]—Astrakhanskaya stantzīya zashchītui rastenīĭ ot vredīteleĭ [*Astrakhan Plant Protect. Sta.*], nos. 22 (2nd Ed.), 57 & 58. Astrakhan, August–September 1925. [Recd. December 1925.]

These popular leaflets deal respectively with the life-history and control of *Rhynchites bacchus*, L., on apples, by A. Doĭnīkov; *Barathra* (*Mamestra*) *brassicae*, L., on cabbages, by K. Stepanov; and *Piophila casei*, L., as a pest of salted fish, by N. Sakharov.

[Uvarov (B. P.).] **Уваров (Б. П.). Current Work on the Study of Locusts in different Countries.** [*In Russian.*]—Khlopkovoe Delo [*Cotton Industry*], iv, no. 9–10, pp. 850–860, 14 refs. Moscow, September–October 1925.

This is a review of current investigations on the classification, distribution, ecology and bionomics of locusts. International co-operation in research work on the locust problem is strongly advocated.

[Makalovskaya (V. N.).] Makalowskaja (W. N.). **Zur Biologie der** *Locusta migratoria*, **L. (Wanderheuschrecke).**—*Zool. Anz.*, lxiv, no. 11–12, pp. 295–306, 1 fig., 4 refs. Leipzig, 20th November 1925.

This paper contains the results of morphological studies on variability in *Locusta migratoria* undertaken with a view to checking Uvarov's theory of phases [*R.A.E.*, A, ix, 561]. Exact measurements of long series of specimens collected in various parts of the Tartar Republic (late Kazan Government) during invasions of locusts in 1922, 1923 and 1924, showed that no transformation of the swarming phase into the solitary one took place.

[Parfent'ev (Ī. A.).] **Парфентьев (И. А.). The Control of Storage Pests in Elevators.** [*In Russian.*]—*Défense des Plantes*, ii, no. 4–5, pp. 202–205. Leningrad, August 1925. [Recd. December 1925.]

Experiments in 1924 in an old fashioned type of wooden elevator have proved the value of fumigation with chloropicrin for the control of grain pests. Though the grain retains the smell of the gas for a considerable time, this disappears on milling, and no trace of scent or taste is perceptible in bread made from the flour. The germination of the seed is, however, slightly affected, though the fumigated grain has no toxic properties.

In the experiments described the chloropicrin was sprayed through a small opening into the silo, and after about 30 to 60 minutes (sufficient for the evaporation of the liquid) the silo was loaded with grain through the same opening. As the grain fell to the bottom of the silo, it became impregnated with chloropicrin gas, thus ensuring its even distribution throughout the bulk. For the fumigation of empty silos the proportion of 2 litres of liquid chloropicrin to 100 cubic metres of the space involved was sufficient; when grain was about to be placed in these silos a further 4 litres of the liquid chloropicrin was added for each load of grain (about 36,000 lb.). After an exposure of 72 hours to this concentration, all weevils, mites and the eggs of mites introduced in bags amongst the grain, as well as all weevils occurring in samples of grain tested, were killed. The high dosages used were considered necessary owing to the absorption of gases by the grain and the low prevailing temperatures, 5–9° C. [41–48·2° F.]. No doubt in elevators of a more efficient type with ferro-concrete silos and at higher temperatures very much lower concentrations would prove effective. However, even at the above high concentrations the method is economically practical and does not require any specially elaborate equipment.

[STARK (V. N.).] **Старк (В. Н.). The Importance of Forest Fires as Creating Foci of Bark-beetles in the Briansk Government.** [*In Russian.*]—*Défense des Plantes*, ii, no. 4–5, pp. 205–212, 4 tables. Leningrad, August 1925. [Recd. December 1925.]

The importance of forest fires in causing outbreaks of bark-beetles is further discussed [*R.A.E.*, A, xiii, 472]. The development of bark-beetles in large numbers in a burnt area is always followed by an intensive flight to the surrounding healthy trees, and although the first individuals to attack these trees may succumb as a result of the exudation of resin, the tree is too much weakened to withstand further attack. When the burnt areas are cleared, the work should, therefore, be planned from their margins towards their centres, and the smaller areas treated first. The larger the area the slower will be the development of an intensive infestation. The order in which the different burnt areas are selected for treatment must also depend on their proximity to permanent breeding-places of the bark-beetles. The particular species concerned is a factor; thus *Myelophilus minor* may invade an area from a distance of as much as 7,000 ft., whereas an invasion by *M. piniperda* would only be expected at a distance of less than 5,000 ft.

[BEREZHKOV (R. P.).] **Бережков (Р. П.). The Acridodea of the Tomsk Government.** [*In Russian.*]—*Défense des Plantes*, ii, no. 4–5, pp. 212–217, 7 refs. Leningrad, August 1925. [Recd. December 1925.]

This annotated list of the locusts collected by various workers in the Tomsk Government comprises 26 species. It is not, however, necessarily complete, as the collections were only made in connection with control work. The only previous list is that of N. Zubovskiĭ (1899), containing four species not mentioned in the present list.

[BELOSEL'SKAYA (Z. G.).] **Белосельская (З. Г.). On the Biology of some injurious Leaf-rollers.** [*In Russian.*]—*Défense des Plantes*, ii, no. 4–5, pp. 217–226, 2 pls. Leningrad, August 1925. [Recd. December 1925.]

Leaf-rollers have been causing considerable injury to fruit under glass in Leningrad. The species concerned are *Tortrix* (*Cacoecia*) *rosana*, L., *Oxygrapha* (*Acalla*) *variegana*, Schiff., and *Argyresthia ephippiella*, F. All these moths attack both apricots and plums.

Observation on *O. variegana* was begun after the apricots had bloomed, and larvae were collected at this time among the very young leaves. They continued feeding up to the end of June. Pupation began on 31st June, the greater number pupating about the middle of July. Pupation may occur on the lower surface of the leaves or in e soil. The first adults were noticed on 15th July and the st on 8th September. The eggs are mostly laid at the base of the af-buds either in batches or singly ; the winter is passed in this stage. n the case of *T. rosana* the first pupae were found on 15th June and e last on 12th July. Pupation occurs in the rolled leaves and lasts bout 14 to 18 days. The eggs are laid on any convenient place such s the wall, boards, etc., but mainly on the trunks and larger branches. he winter is passed in the egg stage. Fumigation with tobacco dust n the evening gave satisfactory results.

OSTANĪNA (K. Ī.).] **Останина (К. И.).** *Abraxas grossulariata,* **L.** [*In Russian.*]—*Défense des Plantes,* ii, no. 4–5, pp. 226–237. Leningrad, August 1925. [Recd. December 1925.]

In Northern Russia, *Abraxas grossulariata,* L., hibernates as a rva on the ground among fallen leaves, emerging before the end May. Though a number of other food-plants were eaten under xperimental conditions, the larvae only thrived on gooseberries nd currants. Pupation begins about the middle of June, and the upal stage lasts about four weeks. In nature the pupae are found eep in the bush, on the shoots close to the ground or on the grass nder the bushes. The oviposition period lasted 18 days in the open t a fairly even temperature.

Parasites recorded are the Braconids, *Apanteles glomeratus,* L., nd *Rhogas armatus,* Wesm., reared from the larvae, and the Ichneumonid, *Ichneumon trilineatus,* Gmel., reared from the pupae. The arious remedial measures recommended in the past were mainly the ollection of larvae, and cultural practices, both of which, however, re of very limited application. Spraying with Paris green or Urania reen 1 lb. to 96 gals. water gave good results under artificial conditions in August, and it is suggested that this method should be qually satisfactory if applied in the spring before the blossoming of ooseberries.

BRYANTZEV (B. A.).] **Брянцев (Б. А.). On the Biology of** *Pieris brassicae,* **L., in the Leningrad Government.** [*In Russian.*]—*Défense des Plantes,* ii, no. 4–5, pp. 237–241. Leningrad, August 1925. [Recd. December 1925.]

This is a series of notes on the biology of *Pieris brassicae,* L., as observed in 1923. There are two generations a year, hibernation occurring n the pupal stage.

ĪSAEV (A.).] **Исаев (A.).** *Charaeas graminis,* **L., in the Leningrad Government.** [*In Russian.*]—*Défense des Plantes,* ii, no. 4–5, pp. 270–272. Leningrad, August 1925. [Recd. December 1925.]

Notes are given on the seasonal history of *Charaeas graminis,* L., n various localities of the Leningrad Government. Numerous grasses re attacked, and also rye and oats, and to a less extent, barley. owards the middle of June the larvae enter the soil for pupation. n certain districts the crops were protected by digging trap trenches nd spraying with Urania green 3 oz. to 1½ lb. of soft soap and 18 gals. of water. Large numbers of the larvae were destroyed by poultry nd other birds.

Rambousek (F.). **Ochrana řepných polí v zimě a na jaře.** [Th Protection of Turnip Fields.]—*Ochrana Rostlin*, v, pt. 4–5, pp. 62–67, 5 figs. Prague, November 1925.

A popular account is given of various disease and insect pests likely to occur in turnip fields in Czechoslovakia.

Blattný (C.). **Poznámky k letošnímu zdravotnímu stavu chmele.** [The Current Year's Hop Conditions.]—*Ochrana Rostlin*, v, pt. 4–5, pp. 67–74, 2 figs. Prague, November 1925.

An account is given of the seasonal occurrence of various hop pests during 1925, the more important of which have already been noticed [*R.A.E.*, A, xiii, 303].

Eidmann (H.). **Zur Kenntnis der Biologie von** *Cetonia floricola* **Hbst.** [Contribution to the Biology of *C. floricola*.]—*Zool. Anz.*, lxv, no. 1–2, pp. 21–28, 1 fig., 18 refs. Leipzig, 5th December 1925.

The favourite food of *Cetonia floricola*, Hbst., when adult, is the sap that oozes from wounds in the bark of willows and oak trees, but it also feeds on parts of flowers and sometimes becomes a pest on roses. The eggs, which hatch in 3 or 4 weeks, are laid in June and July, and the larvae live in the nests of the red wood-ant [*Formica rufa*, L.] for 3 or 4 years. Pupation takes place from May to July, the adult appearing 1–3 months later.

[Īvanova (S. A.).] Iwanowa (S. A.). **Zur Frage über die Spermatophorbefruchtung bei den Acridodea** (*Locusta migratoria*, **L.**). [On the Question of Spermatophore Fertilisation in Acridodea.]—*Zool. Anz.*, lxv, no. 3–4, pp. 75–86, 10 figs., 7 refs. Leipzig, 20th December 1925.

The internal genitalia of the male of *Locusta migratoria*, L., are described in detail.

Schander (R.) & Meyer (R.). **Untersuchungen über die Fritfliege.** [Investigations on the Frit Fly.]—*Arch. Natg.*, Abt. A, xc (1924), no. 12, pp. 12–87, 12 figs., 141 refs. Berlin, December 1925.

This paper deals fully with the biology of *Oscinella* (*Oscinis*) *frit*, L. (frit fly), its distribution and the damage it does, the history of its periodicity, its appearance with other pests and with fungi, and its natural enemies, with descriptions of some of its parasites. The influence of weather conditions on the development of the insect, and the effects of various soils, methods of planting, time of ploughing and manuring, on its numbers are discussed. The various remedial measures are reviewed, cultural methods comprising ploughing in early and sufficiently deeply all fallen grain after harvest, planting quick-growing varieties of cereals and giving nitrogenous manures to ensure speedy growth. In the case of attack a top-dressing that is quickly effective should be applied, but where there is an advanced and serious infestation ploughing under is advised. Wild grasses should be kept down in and near the fields.

A bibliography includes summaries of the more important articles dealing with this pest.

Notice Relative to Insecticide and Fungicide Laws.—*Service & Regulatory Announcements. U.S. Dept. Agric., Insect. & Fungic. Bd.,* no. 52, pp. 1193–1227. Washington, D.C., November 1925.

This is a compilation of the laws passed between June 1921 and January 1925 relating to insecticides and fungicides in a number of different States.

Kerr (A. P.) & Smith (C. E.). **Toxicity of Sodium Silicofluoride and Arsenical Mixtures to Plant Foliage.**—*Offic. Rec. U.S. Dept. Agric.*, iv, no. 48, p. 5. Washington, D.C., 2nd December 1925.

During experiments for the control of the blister beetle, *Epicauta lemniscata*, it was found that dusts containing calcium arsenate and sodium silicofluoride caused greater injury to the plants treated than either of these used alone. Similar results were also obtained with a part of Paris green to 19 of sodium silicofluoride. It was concluded that, as a result of the reactions occurring when Paris green or calcium arsenate is mixed with sodium silicofluoride in the presence of moisture, high percentages of water-soluble arsenic are released. Further tests were made by adding distilled water to equal parts of calcium arsenate and sodium silicofluoride and allowing it to stand for an hour. After this process had been repeated several times, the final water-soluble arsenic (As_2O_5) varied from 87·87 to 93·8 per cent. of the total amount of arsenic in the mixture. A similar mixture of lead arsenate and sodium silicofluoride produced only 1·5 per cent. of water soluble arsenic (As_2O_5) of the total amount of arsenic in the mixture. This is about the amount normally found in lead arsenate. In the case of Paris green and sodium silicofluoride in equal parts the water-soluble arsenic (As_2O_3) was 9·4 per cent. of the total amount of arsenic present, but when this test was repeated with 1 part of Paris green to 19 of sodium silicofluoride, the water-soluble arsenic was increased to 52·2 per cent. This is apparently due to the displacement of the equilibrium in the mixture in the direction that gives a greater percentage of water-soluble arsenic.

Caldis (P. D.). **A Rot of the Calimyrna Fig in California.**—*Phytopathology*, xv, no. 11, p. 728. Lancaster, Pa., November 1925.

A rot of the fruit of figs, observed in 1922 for the first time, is due to a form of *Fusarium moniliforme*, the spores of which are carried into the figs at caprification by the Chalcid, *Blastophaga psenes*, L. The fungus grows on the bodies of the dead insects and on the stigmas of the flowers in the cavity of the fig, and then invades the tissues of the ripe fruit.

Barss (H. P.) & Stearns (H. C.). **The Green Muscardine Fungus (*Oospora destructor* (Metschn.) Delacroix) on European Earwig and other Insects in Oregon.**—*Phytopathology*, xv, no. 11, p. 729. Lancaster, Pa., November 1925.

A fungous disease, apparently due to *Oospora destructor*, has been found repeatedly at Portland, Oregon, in the European earwig [*Forficula auricularia*] and other insects, both out of doors and in an insectary. Artificial infections of healthy earwigs with a pure culture of the fungus killed the insects. Abundant moisture seems to be necessary to bring about infections, and there seems little reason t expect the fungus to become of importance in the biological contro of the earwig under the climatic conditions prevailing in the Pacifi Northwest.

PLAKIDAS (A. G.). **An Obscure new Disease of the Strawberry in California.**—*Phytopathology*, xv, no. 11, p. 730, 1 ref. Lancaster Pa., November 1925.

The decline of productiveness in strawberry plantations in certain parts of California is attributed to a disease, the virus of which i believed to be transmitted from diseased to healthy plants by mite and insects, probably *Tetranychus telarius*, L., and *Myzus fragaefolii* Ckll. Experiments to determine this are now in progress.

CARSNER (E.). **A Bean Disease caused by the Virus of Sugar-beet Curly-top.**—*Phytopathology*, xv, no. 11, p. 731. Lancaster, Pa., November 1925.

A severe epidemic disease of beans in Idaho in the spring of 1924 was possibly caused by the leafhopper, *Eutettix tenella*, which transmits the virus of curly-top disease to sugar-beet. Greenhouse experiments with two varieties of beans and leafhoppers infected with the virus of curly-top showed the infection to be transmitted to beans by these insects.

ZELLER (S. M.). **Preliminary Reports on Transmission of Dwarf of Loganberry.**—*Phytopathology*, xv, no. 11, p. 732, 1 ref. Lancaster, Pa., November 1925.

Aphids, originally obtained from *Rosa rubiginosa*, were allowed to feed for several days on loganberry plants affected with dwarf disease, and were then transferred to the young leaves of healthy loganberry plants grown under cages. Slight or severe necrosis along the veins and margins of the leaves resulted within six days, and all subsequent growth exhibited the symptoms of dwarfing that are usually observed in the field. When Aphids from the same source were transferred from healthy plants to other healthy ones no symptoms of the disease appeared.

COOLIDGE (W. D.). **High Voltage Cathode Rays outside the Generating Tube.**—*Science*, lxii, no. 1611, pp. 441–442. Garrison, N.Y., 13th November 1925.

In the course of experiments with cathode rays upon various substances it was found that fruit-flies when exposed to the ray for a small fraction of a second instantly showed almost complete collapse, and died in a few hours.

OLITSKY (P. K.). **The Transfer of Tobacco and Tomato Mosaic Disease by the** *Pseudococcus citri*.—*Science*, lxii, no. 1611, p. 442. Garrison, N.Y., 13th November 1925.

Spontaneous mosaic disease does not occur in normal tobacco or tomato plants, nor is the disease seed-borne, but care should be taken to eliminate the mealybug, *Pseudococcus citri*, Risso, which has been proved to be a vector of the disease in greenhouses.

e **Mexican Bean Beetle.**—*Science*, lxii, no. 1611, suppmt., p. xii. Garrison, N.Y., 13th November 1925.

In spite of determined efforts to prevent it, the Mexican bean beetle *pilachna corrupta*] invaded the State of Ohio in 1924, and in 1925 established a line across the south-eastern part of Indiana. Slight stward extension of attack in the mountainous regions from Penn- vania southward to North Carolina is also disturbing, for if the pest sses the natural barrier of the Appalachian chain, it may overrun e Piedmont and Coastal Plain regions.

Although the adult beetle itself does considerable damage, the real rm is done by the larva, which feeds voraciously on the leaves of all nds of crops and vegetable plants, skeletonising the leaves and causing em to turn yellow. The only effective means of control is spraying d dusting with arsenicals.

TCH (E. M.). **The Primary Foodplant of the Melon Aphid.**—*Science*, lxii, no. 1614, p. 510. Garrison, N.Y., 4th December 1925.

The primary food-plant of *Aphis gossypii*, a serious pest of cotton, elons, oranges, etc., is believed, as the result of experiments, to be *dum telephium*, from which it migrates to its various summer food- nts.

NK (D. E.). **Physiological Studies on Hibernation in the Potato Beetle,** *Leptinotarsa decemlineata*, **Say.**—*Biol. Bull. Mar. Biol. Lab.*, xlix, no. 5, pp. 381–406, 5 tables, 13 figs., 29 refs. Woods Hole, Mass., November 1925.

The hibernation of the potato beetle, *Leptinotarsa decemlineata*, y, is fully discussed from its physiological aspect.

The results of food experiments indicate that beetles of the first neration when fed on tubers and fruit of the potato, tomato and gplant [*Solanum melongena*] feed for 13 days before entering hiberna- on, while those fed on the foliage of the same plants need 16 days. eetles fed on potato foliage for six days followed by a non-solanaceous od required 23·6 days, and a mortality of 55 per cent. occurred. hose fed on non-solanaceous plants do not hibernate, and die of arvation.

Respiratory metabolism determinations show that the oxygen nsumption of beetles fed on tubers or fruit of solanaceous plants is ss than of those fed on foliage. When they were fed on non- lanaceous foods, the reduced oxygen intake recorded was comparable ith the oxygen consumption of starving animals. A reduced carbon oxide output occurs throughout the progress of hibernation. Actual ntact of the insect with water seems necessary to restore its water ntent before feeding is possible.

ISHER (W. S.). **A New Cactus Weevil from Texas.**—*Jl. Wash. Acad. Sci.*, xv, no. 18, pp. 425–426, 1 ref. Baltimore, Md., 4th November 1925.

Gerstaeckeria (*Philopuntia*) *doddi*, sp. n., obtained in connection ith the prickly-pear insect investigation in Texas, is described.

HARNED (R. W.). **Annual Report of the Zoology and Entomolog Department.**—*37th Ann. Rept. Mississippi Agric. Expt. Sta 1923-24,* pp. 24–28. A. & M. College, Miss. [1925.] [Rec December 1925.]

Amongst the Tachinids parasitic on insect pests of southern crop *Archytas analis*, F., and *Winthemia quadripustulata*, Macq., have bee abundant and effective in the control of cutworms. Others of econom importance are *Phorocera claripennis*, Macq., on *Datana* sp. on oak *P. floridensis*, Towns., on *Melalopha inclusa*, Hb., or *M. apicali* Wlk. (poplar tent caterpillars) ; *Belvosia unifasciata*, R.-D., on *Cirph unipuncta*, Haw. ; *Metavoria orientalis*, Towns., on *Protoparce sext* Joh. (tomato worm) ; and *Nemorilla maculosa*, Meig., on *Pyraust tyralis*, Gn., a budworm of dahlias.

The following Coccids are recorded for the first time from Mississippi *Aspidiotus destructor*, Sign., on *Euonymus* ; *A. diffinis*, Newst., o poplars ; *Lecaniodiaspis tessellata*, Ckll., on a wild plant, possibly species of *Hypericum* ; *Lecanium pini*, King (*corrugatum*, Thro on pine trees ; *Pulvinaria psidii*, Mask., on mulberry ; and *Lepidosaphes newsteadi*, Sulc., on *Cryptomeria*. *Balaninus caryae*, Hor (pecan weevil) has been increasing in both abundance and importance another serious pest of pecans is *Hyphantria cunea*, Drury (fall web worm), which occurs throughout the State. Various substances ar to be tried for the control of *Phylloxera* attacking pecans, the specie concerned being *P. conica*, Shm., *P. minimum*, Shm., *P. caryaeglobuli*, Walsh, *P. caryaecaulis*, Fitch, *P. devastatrix*, Perg., *P. perniciosa*, Perg., and *P. foveola*, Perg.

NEAL (D. C.). **Annual Report of Plant Pathology Department.**—*37t Ann. Rept. Mississippi Agric. Expt. Sta., 1923-24,* pp. 28–31 A. & M. College, Miss. [1925.] [Recd. December 1925.]

Experiments are being made to ascertain the effect of inoculated sulphur for the control of *Heterodera radicicola* producing root-knot in peach trees. Amounts varying from 500 to 2,000 lb. per acre were broadcast, the soil being neutralised 60 days later by the application of air-slaked lime. Though the work will have to be continued over a number of years before any definite conclusions can be drawn, the results at present indicate some benefit from the treatment.

VORHIES (C. T.). **Entomology.**—*33rd Ann. Rept., Arizona Agric. Expt. Sta., 1921-22,* pp. 219–220. Tucson, Ariz. [n.d.] [Recd. December 1925.]

Clastoptera obtusa, Say, has been causing injury to grapes in Arizona. It occurs commonly on the native wild grape (*Vitis arizonica*) in the mountains and will readily attack neighbouring cultivated grapes. This is the first record of a froghopper attacking cultivated fruit of any kind.

YOUNGBLOOD (B.). **Thirty-sixth Annual Report 1923.**—*Texas Agric. Expt. Sta.*, 31 pp. College Station, Tex. [n.d.] [Recd. December 1925.]

In the course of this report a brief account is given of a study of *Cylas formicarius*, F. (sweet potato weevil) and its control, this information having already been noticed from another source [*R.A.E.*, A, xii, 333].

AMILTON (C. C.). **The Boxwood Leaf Miner** (*Monarthropalpus buxi,* **Labou.).**—*Maryland Agric. Expt. Sta.*, Bull. 272, pp. 143–170, 2 pls., 8 figs., 9 refs. College Park, Md., February 1925. [Recd. December 1925.

The life-history and stages of the Cecidomyiid, *Monarthropalpus* *xi*, Lab. (boxwood leaf-miner) are described from observations ade in Maryland [*R.A.E.*, A, x, 72]. The eggs are inserted in the ves from the lower surface, but are placed slightly nearer the upper rface. In the laboratory the average number of eggs laid by each male was 29, but many do not hatch, the number increasing with e severity of the infestation and sometimes amounting to 90 per cent. ere are four larval instars, but during the first, which lasts from the ginning or middle of June to the middle or end of July, the larva es not move from the egg cavity. The second instar larvae begin ining the leaves and feeding on the tissue, and as they feed the rrounding cells become enlarged, probably owing to the secretion an enzyme by the larvae. Hibernation takes place in the third star, which lasts from the middle or end of September to the middle end of March. Pupation occurs in the latter half of April.

Boxwood plants attacked by *M. buxi* lose vitality, and though e leaves are normally retained for several years, those of badly insted plants last for little more than a year. Several pupae found the author in galls of *M. buxi* were apparently those of a Chalcid. nts have been seen to enter infested leaves to feed on larvae or pupae ntained in them.

Existing literature on the control of *M. buxi* is reviewed. After e years' experiments, the author has found that the most satisfactory ethod is spraying with molasses, 1 part to 4 parts water, together ith 40 per cent. nicotine sulphate, 1 part in 500. The first application ould be made just before the emergence of the first adults, that is, hen the wing-pads, legs, and antennae of the pupae become dark. ne or two more applications should be made at intervals of about or 6 days, as the emergence period extends over 2 or 3 weeks. If ssible the plants should be covered with canvas or thick muslin fore rain, or another application of spray should be made immediately ter it. The spraying should be done very thoroughly and at nsiderable pressure, to ensure the complete covering of the leaves. ood results have been obtained by the above method, 99 per cent. ntrol being obtained in one case. The oil and nicotine sulphate ray recommended by Primm and Hartley [*R.A.E.*, A, xi, 583] as tested and gave fairly good control, but caused considerable orching. Free nicotine was found in laboratory tests to be less tisfactory than nicotine sulphate. Other sprays tested, including ne tar creosote, molasses alone, and molasses in combination with yrethrum extract, tobacco dust and various proprietary insecticides, ere either not effective or more expensive than molasses and nicotine lphate.

OPENOE (C. H.). **Mushroom Pests and how to control them.**—*U.S. Dept. Agric.*, Farmers' Bull. 789, revd. ed., 6 pp., 6 figs. Washington, D.C., July 1925. [Recd. December 1925.]

This is a revised edition of a bulletin already noticed [*R.A.E.*, A, , 423]. Hydrocyanic acid gas is an additional remedy discussed for the control of mushroom maggots (*Sciara multiseta,* Felt, *S. agrari* Felt, and *Aphiochaeta albidihalteris,* Felt). It should be used at th rate of 3 oz. of sodium or calcium cyanide to each 1,000 cu. ft. of spac and applied when the atmosphere of the house is relatively dry, 4 to applications being made over a period of 2 weeks. The gas should b released in the evening and the house ventilated before sprinkling dow the following morning.

Agriculture Yearbook, 1924.—8vo, vi+1252 pp., 44 figs. Washington D.C., U.S. Dept. Agric., 1925. Price $1.50.

A very brief review (pp. 68–71 & 557–558) is given of th conditions with regard to the more important insect pests in th United States of America. Effective work has been done by th Federal quarantine in limiting the spread of the European corn borer [*Pyrausta nubilalis,* Hb.]. The spread of the gipsy mot [*Porthetria dispar,* L.] has also been checked, and the infestatio in New Jersey has been reduced by more than half since its original introduction into that State. During the past four year the area infested by the brown-tail moth [*Nygmia phaeorrhoea* Don.] has been decreased by nearly 3,000 sq. miles. The developmen of more efficient remedial measures and the introduction of natura enemies from Europe are the causes of the gradual reduction of in festation by these two moths in New England. With the exception o New Mexico and the western districts of Texas, the pink bollwor [*Platyedra gossypiella,* Saund.] has not reinfested any of the areas wher it had previously appeared. Further entry of this pest from Mexic is now prevented by inspection and disinfection of all border traffi into the United States. During 1924 this involved the inspection c some 29,000 freight cars and the fumigation of nearly 17,000 of these The value of aeroplanes in agriculture, including their use in th application of dusts, etc., is briefly discussed.

Snodgrass (R. E.). U.S. Bur. Ent. **Cankerworms.**—*Ann. Rept Smithsonian Inst., 1924,* pp. 317–334, 19 figs. Washington, D.C. 1925.

This is a popular account of the life-histories of the Geometrids *Palaeacrita vernata* (spring cankerworm) and *Alsophila pometaria* (fall cankerworm), in the northern United States [*cf. R.A.E.*, A, vi 546 ; xiii, 24].

Morrison (H.). **Identity of the Mealybug described as** *Dactylopius calceolariae* **Maskell.**—*Jl. Agric. Res.*, xxxi, no. 5, pp. 485–500 6 figs., 16 refs. Washington, D.C., October 1925. [Recd. January 1926.]

The name *Pseudococcus* (*Dactylopius*) *calceolariae* has been used in literature to designate several different species of mealybugs. Its use should, however, be restricted to specimens identical with those collected by Maskell at Christchurch, New Zealand, on *Traversia,* in 1878 Examples from New Zealand on *Danthonia* appear to be new, and are described as *Trionymus danthoniae,* sp. n., whilst those from *Phormium* *ax* from several parts of the world should be referred to *T. diminutus*, onardi. The name *Pseudococcus boninsis*, Kuwana, should be plied to specimens of the elongate grey mealybug known to occur on ar-cane in many parts of the world and previously identified as *calceolariae*. Some references to the species *P. saccharifolii*, Green, l *T. sacchari*, Ckll., both of which appear to be distinct and valid cies, actually refer to *P. boninsis*. *P. calceolariae* var. *minor*, skell, is identical with *P. citri*, Risso. A key is given to the various cies discussed.

species found among Maskell's specimens of *P. calceolariae* is sidered to be distinct and is here described as *P. ambiguus*, sp. n.; hing definite is known about its distribution or food-plant, but it presumably a New Zealand species.

ANKLIN (H. J.). **Cranberry Insect Investigations.**—*Ann. Rept. Cape Cod Cranberry Growers' Assoc.*, xxxvi (1923–24), pp. 4–7. Wareham, Mass. (Abstract in *Expt. Sta. Rec.*, liii, no. 6, p. 555. Washington, D.C., 1925.)

mphicoma vulpina (root grub) may be killed by a solution of 1 oz. ium cyanide in 20 U.S. gals. water, soaked into the surface soil the beginning of May at the rate of 1 U.S. gal. to the square foot. yellow-head fireworm [*Peronea minuta*] and *Gelechia trialbamacu*- *a* (red-striped fireworm) can both be controlled by killing the moths ly in April with a spray of 1 U.S. qt. nicotine sulphate and 4 lb. -oil soap in 100 U.S. gals. water. Lead arsenate sprays, 3 lb. of vder to 50 U.S. gals. water, applied about 24th May will also trol these pests. The moths of the cranberry girdler [*Crambus tuellus*] can be destroyed by spraying with 20 lb. caustic fish-oil p in 100 U.S. gals. water, at the rate of 800 U.S. gals. per acre if the es are thick. This spray is supplemented with two or three plications of nicotine sulphate and soap.

he cranberry fruitworm [*Mineola vaccinii*] was parasitised by *ichogramma minutum* during 1923 to an extent of up to 50 per cent. the flooded bogs and from 14 to 50 per cent. on the dry ones. The ond brood of the blackhead fireworm [*Rhopobota naevana*] may be ntrolled by lead arsenate sprays applied about two days after the vae begin to hatch. During 1922 large numbers of the second neration were destroyed by a fungus, *Entomophthora* sp. During 23 considerable damage was done by the spotted cutworm [*Agrotis igrum*], but observations indicate that this pest only attacks cran-ry bogs when the winter water is held later than 20th May.

RE (J. D.). **The Mole Cricket** (*Scapteriscus vicinus*, **Latr.**).—*Georgia Expt. Sta.*, Bull. 101 (Revised), 12 pp., 1 pl. Experiment, Ga., June 1924. [Recd. December 1925.]

Scapteriscus vicinus, Scud., causes considerable injury to a number crops in Georgia. Those most seriously attacked include lettuce, matos, turnips and potatoes, while of the staple crops it is an portant pest of sugar-cane. It is the most injurious of the mole ckets occurring in Georgia, the others being *Gryllotalpa hexadactyla*, rty, and *S. acletus*, Rehn & Hebard. An account is given of the life-history and habits of *S. vicinus*; the complete developme requires about 8 to 12 months, of which 3 or 4 weeks are spent in th egg stage. The eggs are laid during April, May and June, near th surface beneath grass sod. The favourite breeding-grounds a grass land or land once under cultivation.

The measures recommended are poison baits of Paris green [*R.A.E* A, xii, 29] or calcium arsenate. The formula for the latter is 100 l cotton-seed meal, 100 lb. rice flour, and 10 lb. calcium arsenate, slight moistened with a solution of low grade molasses (1 part to 10 of water Sugar-cane should be planted so that the eye comes above the groun Supplementary measures are ploughing over the breeding areas betwee 15th April and 15th June, and the trapping of the adults by means compost heaps in winter and trap lights. The scattering of sulphu in the seed drill with the seed acts as a repellent to a certain exten and in the case of tomatos and similar plants, each one should be bande with tin, paper, or wire cylinders.

Hayes (W. P.). **A Comparative Study of the History of certai Phytophagous Scarabaeid Beetles.**—*Kansas Agric. Expt. Sta* Tech. Bull. 16, 146 pp., 10 pls., 7 pp. refs. Manhattan, Kans July 1925. [Recd. January 1926.]

This forms a further report on studies of Kansas Scarabaeids, som of the results of which have already been published [*R.A.E.*, A, v 285; vi, 207; vii, 227; viii, 391; ix, 539; x, 379].

An attempt is here made to compare the life-cycles of 16 species Melolonthids, Rutelids, Dynastids and Cetoniids, *viz.*: *Lachnoster (Phyllophaga) praetermissa*, Horn, *L. longitarsa*, Say, *L. biparti* Horn, *L. vehemens*, Horn, *L. fusca*, Froel., *L. corrosa*, LeC., *L. hirticul* var. *comosa*, Davis, *L. crenulata*, Froel., *L. affabilis*, Horn, *L. tristi* F., *Anomala innubia*, F., *Pelidnota punctata*, L., *Cotalpa lanigera*, L. *Ligyrodes relictus*, Say, *Euphoria fulgida*, F., and *E. sepulchralis*, F.

The life-cycles as observed at Manhattan, Kansas, are compared wit those of other members of the family. So far as possible each specie has been considered in relation to its distribution, relative abundanc at Manhattan, attraction to light, period of flight, food habits an general biology. The life-cycle in the Melolonthids is highly variabl requiring from one to three years, and in northern latitudes probabl even four. The Rutelids in one tribe, the Anomalini, need only on year, while the Rutelini require at least two and sometimes thre years to mature. The Dynastids and Cetoniids require only one yea

Miller (A. E.). **An Introductory Study of the Acarina, or Mites, c Ohio.**—*Ohio Agric. Expt. Sta.*, Bull. 386, pp. 83–172, 4 pls., ref Wooster, Ohio, August 1925. [Recd. January 1926.]

In this paper 127 species of Acarina are recorded from Ohio, of whic 28 are of economic importance either as crop pests or as attackin man and animals. In the case of the more important the most effectiv practical control known is quoted. The technique involved in th preparation and preservation of mites is described in detail.

RIGHT (C. R.). **Subterranean Aphids of Ohio.**—*Ohio Agric. Expt. Sta.*, Bull. 387, pp. 173–238, 6 pls., refs. Wooster, Ohio, September 1925. [Recd. January 1926.]

A list of 21 species of Aphids found in Ohio that live underground ing the whole or part of their life-cycle, and keys to the genera ncerned, both for the alate and apterous forms, are given. The nge to the underground habitat in Aphids is probably, in most cases, more recent date than the formation of genera, and has certainly n brought about, at least in some species, by the agency of ants ; *his forbesi*, Weed, seems to show this change in the process of lution. Complete migration in spring and autumn as an essential t of the life-cycle has not yet been proved for any subterranean cies. There are several possible explanations of the non-migration certain subterranean Aphids : the migratory habit may be slowly ng out, as in the case of *Anoecia querci*, Fitch, owing to the advantage ned by the ability of certain individuals to pass the winter in the l ; in this way migration may have ceased entirely in some species, or alternate food-plant may be unknown ; another explanation, vanced by Mordvīlko [*R.A.E.*, A, xi, 564], is that the alternate d-plant may have died out. There are, however, so many variations migration that no explanation applicable to all the subterranean cies can be given ; this is probably due to the specialisation in each cies and the wide range of phylogenetic relationships. In addition the degrees of specialisation in the life-cycles of the various sub-ranean species, there are varying degrees in their dependence on s ; while some species flourish in the absence of ants, others are olutely dependent upon them, especially for the location of food.

ll subterranean Aphids thrive when a high percentage of moisture resent. They are active and can reproduce at low temperatures ° F.). In the author's experience they are exceptionally free from asites and predators, and this freedom from enemies is the great vantage of the subterranean habitat, the chief disadvantage being the iculty of finding food.

otes on the life-history of each of the species listed, together with ir more important synonyms and keys to the species of several of genera, are given. *Anoecia corni*, F., and *A. querci*, Fitch, are h found in summer on the roots of grasses, where they are attended ants ; the former has been found only on *Dactylis glomerata* (orchard ss) and *Agrostis alba* (redtop grass), while the latter has been found a number of grasses, but not on *Dactylis* or *Agrostis*. *A. querci* o occurs on the roots of *Aster* and *Solidago* in spring and autumn. ne individuals of both species migrate in the autumn to *Cornus*, ere sexual forms are produced and eggs are laid on the twigs and nches, but the greater number pass the winter in ants' nests, while ew remain on roots. Migration to *Cornus* is more pronounced in *corni* than in *A. querci*.

he life-history of *Anuraphis persicae-niger*, Smith (black peach his) is only incompletely known. Some individuals pass the winter the roots of peaches, and it is believed that others do so in ants' ts. In Ohio they are unable to stand the winter temperatures on twigs, as they do in milder climates ; although about 50 per cent. those observed were still alive after being exposed to a temperature 5° F., they were all killed by a temperature of −11° F. Feeding reproduction on roots begin in March or April, and continue throughout the summer, the Aphids being always attended by ant which transfer them to new feeding places, often at considerable di tances, when the colony becomes crowded. In some places larg numbers of Aphids migrate to the twigs of peaches, where winged form the function of which is unknown, appear in May or June. Winge forms also appear in the subterranean colonies in autumn, and it possible that these migrate to an alternate food-plant, on which th winter is passed in the egg stage. Aphids in aerial colonies are som times transferred to roots by ants.

Rhopalosiphum prunifoliae, Fitch (*Aphis avenae*, auct. nec F (apple-grain aphis) [*R.A.E.*, A, ii, 696; viii, 116] has been found t pass the winter on the roots of wheat in Ohio. *Pemphigus lactuca* Fitch, was found on the roots of 35 species of plants, including lettuc distributed among 10 natural orders, but was most abundant c *Solidago graminifolia* and *Aster ericoides*. Winged forms of *P. lactuc* appear on the roots in the autumn, and it is possible that these i dividuals migrate to an alternate food-plant, on which the winter passed in the egg stage, but at least 95 per cent. of each colony pa the winter as apterae on roots. These insects are able to withstan alternate freezing and thawing, and can survive the winter withou food. Feeding and reproduction begin in March or April. The adult are markedly gregarious, but the larvae migrate to fresh food immed ately after birth, probably travelling as much as 100 ft. in some case During the night they travel above ground. If the soil is rocky gravelly, or infrequently cultivated, they are easily able to find foo by reason of the cracks and crevices in it; consequently plants on suc soil are often heavily infested. A high degree of humidity is essentia to *P. lactucae*; little or no wax is secreted at less than 75 per cent humidity; individuals not deprived of their wax secretion survive immersion in water for 7 days, but without it they died in 3 days *P. lactucae* is entirely independent of ants.

Prociphilus erigeronensis, Thomas (white aster root aphis) wa collected from the roots of 28 species of plants belonging to 12 natura orders and including several cultivated crops, but is chiefly importan as a pest of asters. Reproduction begins at the end of April or th beginning of May, but the species is not abundant until late summer *P. erigeronensis* is attended by the ants, *Lasius* spp., and when cult vated asters are killed by frost in October, the Aphids are transferre by the ants to the roots of perennials, whence they are removed t the ants' nests at the end of November. It is also possible for then to pass the winter alone in the soil without food. Winged forms o this Aphid occur when the colony becomes crowded. *Geoica squamosa* Hart., is found on the roots of a number of plants, and occasionall damages wheat; it is dependent on ants for passing the winter an for the location of food; winged forms sometimes occur. *G. radicicola* Essig, has been found on the roots of various plants, including beans sweet peas, and periwinkle (*Vinca minor*), the last two in greenhouses Reproduction begins at 36° F., and is active at 40°. In the laborator apterous females lived on an average 16 days in the summer an reproduced actively for about half that time; the nymphal perio lasts from 9 to 13 days. The first instar nymphs sometimes feed o the same root as the adults, but usually migrate to fresh food. Winge forms occur frequently in the summer and autumn, but their functio is not known. *G. radicicola* is sometimes, but not always, attende by ants. It passes the winter on the roots of perennials, such a *ter cricoides* and *Solidago graminifolia*; it has been found in nests *Lasius niger*, L., in November.

Experiments in the control of *P. erigeronensis* have so far indicated at nicotine sulphate in soapy water [*R.A.E.*, A, xiii, 383] is the best ecticide for use with small numbers of asters; the earth should be lled away from the base, and from 1 U.S. pt. to 1 U.S. qt. should used for each plant. Several applications in the course of the ason may be necessary. Calcium cyanide placed in the earth under ested plants at the rate of 1 gm. to each, killed numerous Aphids, t larger quantities injured the plants.

Peach trees are most liable to be severely attacked by *Anuraphis rsicae-niger* when grown on sandy or gravelly soil. Experiments re made with various substances for the control of this Aphid en planting young peaches in such soil, but the great majority injured e trees. Paradichlorobenzene, ¼ to ⅓ oz. to each tree, can generally used without danger, and seems the most promising for the control this Aphid on roots. Care should be taken when planting peach ees that the roots are not infested with it; to ensure this the plants ay be dipped in a solution of ¾ U.S. pt. 40 per cent. nicotine sulphate d 4 lb. soap in 50 U.S. gals. water, or ½ gal. stock oil emulsion or scible oil in 50 gals. water. If the Aphids appear on the aerial rts of the tree, these solutions may be used as sprays diluted to half e above strength. Apple trees may be treated for *Eriosoma lani-um*, Hausm. (woolly apple aphis) in the same way as peach trees *A. persicae-niger*, care always being taken not to introduce this st on the roots of young trees. Control measures against *Anuraphis idiradicis*, Forbes (maize root aphis) are usually unnecessary if oper cultivation and rotation of crops are employed; a solution of lb. oil of tansy in 1 U.S. gal. wood or denatured alcohol, mixed with 0 lb. fertiliser may be applied as a repellent when the maize is being nted. Good cultivation and the use of uninfested plants and ound should be practised for the control of *Aphis forbesi* (strawberry ot aphis); the plants may be dipped in a nicotine-soap solution before anting. In the spring, when the young Aphids have hatched, but fore growth has started on the strawberries, many of the former ay be destroyed by scattering straw over the ground and burning it.

TRIGHT (C. R.). **Aphids New to Ohio.**—*Ohio Jl. Sci.*, xxv, no. 6, pp. 313–314. Columbus, Ohio, November 1925.

The 18 species of Aphids here recorded are additions to Guyton's t [*R.A.E.*, A, xii, 214]. Bibliographical references to the latest d most complete literature dealing with each species are given.

ules and Regulations of the State Plant Board, effective July 1, 1925. —*Arkansas State Pl. Bd.*, Circ. 13, 20 pp. Little Rock, Ark., July 1925. [Recd. January 1926.]

The rules and regulations in force in Arkansas on 1st July 1925 are re summarised.

Platyedra (*Pectinophora*) *gossypiella* and *Cylas formicarius* are clared pests throughout the State. *Aspidiotus perniciosus*, *A. uvae*, *hrysomphalus tenebricosus*, *C. obscurus*, *Aulacaspis pentagona*, *Eriosoma nigerum*, *Dialeurodes citri*, *D. citrifolii* (*nubifera*) and *Heterodera hachtii* are declared pests in certain areas.

Cooley (R. A.). **The Entomology Department.**—*30th Ann. Rept. Montana Agric. Expt. Sta., 1922–23*, pp. 29–31. Bozeman, Mta., February 1924.

Cooley (R. A.). **Montana Insect Pests for 1923 and 1924, being the 20th Report of the State Entomologist of Montana.**—*Montana Agric. Expt. Sta.*, Bull. 170, 30 pp., 5 maps. Bozeman, Mta., January 1925. [Recd. January 1926.]

The campaign against locusts [*R.A.E.*, A, ix, 585; xii, 302] was continued, and the seriousness of outbreaks is being reduced each year. The Hessian fly [*Mayetiola destructor*, Say] appeared in Eastern Montana, causing as much as 30 per cent. injury in some wheat fields. The jack pine sawfly [*Neodiprion lecontei*, Fitch] caused considerable damage to lodge-pole pines [*Pinus murrayana*] during 1924, and it was associated with an undetermined species of pine leaf-tyer. *Epischnia parkerella*, Schaus, is very destructive to the poisonous loco weed [*Astragalus*], and has been very valuable in ridding the ranges of these plants by boring into the crowns and stems and causing them to wilt and die. *Lepidosaphes ulmi*, L., on apple cannot be controlled by kerosene emulsion under Montana conditions; as a result of a long series of experiments it is recommended that either lime-sulphur or miscible oil be applied just before the leaf-buds open, though if annual systematic spraying is done for the control of scab no special spray will be needed for *L. ulmi*.

Other pests not previously noticed [*loc. cit.*] are *Bryobia praetiosa*, Koch (*pratensis*, Garman) (clover mite), causing considerable annoyance by entering houses; *Tetranychus populi*, Koch (red spider), exceedingly abundant during 1923; *Pemphigus vagabundus*, Walsh, producing disfiguring growths on poplar trees without causing serious injury to them; *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm. (woolly apple aphis), in greater abundance than usual; *Aphis pomi*, DeG. (apple aphis); *Chermes* (*Gillettea*) *cooleyi*, Gill. (spruce gall aphis), becoming abundant in parks, etc.; *Epochra canadensis*, Lw. (currant fruit-fly), which does much to prevent the cultivation of currants; *Bibio albipennis*, Say, the larvae of which occurred in unusual abundance in gardens during 1924; *Phorbia brassicae*, Bch. (cabbage maggot), which caused some damage to cabbages in 1923; *Byturus unicolor*, Say (American raspberry beetle), a persistent and injurious pest; *Melasoma* (*Lina*) *scripta*, F. (cottonwood leaf-beetle), causing severe injury to willows; *Leptinotarsa decemlineata*, Say (Colorado potato beetle), which has advanced over most of Montana and is spreading north-west into British Columbia; *Dermestes lardarius*, L., in injurious numbers in grocery stores; *Tribolium confusum*, Duv., troublesome in a flour mill; *Otiorrhynchus ovatus*, L. (strawberry crown-girdler), which has been more or less prevalent for many years; *Rhynchites bicolor*, F. (rose-bud curculio), which is always present on wild roses and causes considerable injury to cultivated ones; *Coccotorus scutellaris*, LeC. (plum gouger); *Bruchus pisorum*, L., and *B. obtectus*, Say, (pea and bean Bruchids); *Pholus achemon*, Dru., feeding on Virginia creeper; *Ephestia kühniella*, Zell. (Mediterranean flour moth); *Ancylis comptana*, Frohl. (strawberry leaf-roller), occurring on strawberries, blackberries and raspberries; *Cephus cinctus*, Nort. (wheat-stem sawfly); *Myrmica brevinodis*, Emery, an ant that often enters food stores; and the sawfly, *Pontania bozemani*, Cooley, occurring on poplar trees throughout the State.

PARROTT (P. J.). **Some Practical Points relative to Control of Rosy Aphis.**—*Proc. 70th Ann. Meeting New York State Hortic. Soc.*, pp. 17–22. Rochester, N.Y., 1925. [Recd. January 1926.]

The most effective spray for the control of rosy aphis [? *Aphis sorbi*, Kalt.] on apples is lime-sulphur 1 : 8, to each 100 U.S. gals. of which U.S. pt. 4 per cent. nicotine sulphate is added. This is also effective against San José scale [*Aspidiotus perniciosus*, Comst.] and scab, but if Lepidopterous larvae are present, 3 lb. of powdered lead arsenate should be added. The object of the spray is to destroy the larvae of the first brood, and the period for effective treatment is from the time the more advanced buds show about ¼ to ½ an inch of leaf until the tender unfolding leaves begin to curl as a result of attack by the Aphids, that is, just before the pink begins to show in the flower buds. This period generally lasts about 5–10 days according to weather conditions. The lime-sulphur should not be applied at the above strength when the leaves show more than half an inch long, as they are likely to be injured ; in this case 40 gallons of water should be added to each gallon of concentrated mixture. All the buds must be well coated with the spray. Dusts are less satisfactory, but if preferred they should contain not less than 2 per cent. nicotine. Heavy applications must be applied just before the pink stage is reached.

FELT (E. P.). **Report of the Committee on Entomology.**—*Proc. 70th Ann. Meeting New York State Hortic. Soc.*, pp. 56–62. Rochester, N.Y., 1925. [Recd. January 1926.]

These notes on various insect pests recorded in New York during 1924 have been contributed by different members of the committee and entomologists or county agents working in various sections of the State.

STRICKLAND (L. F.). **Codling Moth Control on the Ontario Plain. When to Spray.**—*Proc. 70th Ann. Meeting New York State Hortic. Soc.*, pp. 66–72, 1 fig. Rochester, N.Y., 1925. [Recd. January 1926.]

Experiments on the control of the codling moth [*Cydia pomonella*, L.] carried out in New York State in 1917–1924 are briefly reviewed. A chart showing the average percentage of oviposition during this period indicates that most of the eggs are laid between 23rd June and 20th July. Very few hatch before 30th June, and most of them hatch between 1st and 15th July. The best results are obtained with two applications of lead arsenate, a first of 1¼ lb. dry lead arsenate to 50 U.S. gals. lime-sulphur, applied in the calyx period, and a second of 2½ lb. dry lead arsenate to 50 U.S. gals. lime-sulphur, applied about 26th June. As a result of these two applications 90 per cent. of the apples were free from injury. As compared with the old method of three applications, besides saving the expense of the third spray, the present method produced 3·4 per cent. more fruit free from injury.

MUNDINGER (F. G.). **Susceptibility of the Pear Psylla to Calcium Cyanide Dust.**—*Proc. 70th Ann. Meeting New York State Hortic. Soc.*, pp. 182–186. Rochester, N.Y., 1925. [Recd. January 1926.]

Calcium cyanide dusts of various grades, hydrated lime dust, and several sprays were tried against the eggs and larvae of the pear psylla

[*Psylla pyricola*, Först.]. The first application was made on 14th May, when the trees were dormant. A large number of eggs were found to be collapsed as a result of the application of lime-sulphur. The calcium cyanide dusts are not sufficiently toxic to the larvae of the earlier instars to afford satisfactory control in this stage, and the hydrated lime was even less effective, but a combined dust of calcium cyanide, lime and nicotine sulphate seems promising. For the control of the adults the calcium cyanide dusts, " A " [a fine dust, 80 per cent. passing through a 200-mesh screen, and containing not less than 40 per cent. and not more than 50 per cent. calcium cyanide] and " B " [consisting of " A " dust and 50 per cent. of talc as diluent], are superior to the home-mixed 2 per cent. nicotine-lime or the commercial 2·7 per cent. nicotine dusts. It is suggested that 2 lb. of either " A " or " B " dust may prove as efficient as 1½ lb. of 2 per cent. nicotine dust. The calcium cyanide dusts should be applied on warm still days, the " A " dust at the rate of 1½ lb. and the " B " dust at the rate of 2 lb. per average tree. These dusts may cause some injury to new and tender leaf tissue, but unless applied in excessive quantities or when the leaves are wet they should not seriously injure the mature leaves.

Spray Schedules.—*Proc. 70th Ann. Meeting New York State Hortic. Soc.*, pp. 252–258. Rochester, N.Y., 1925. [Recd. January 1926.]

Schedules are given for the spraying of apples, peaches, cherries, pears, plums and grapes. They have been approved by the New York Agricultural Experiment Station.

ARMSTRONG (G. M.), MORELAND (R. W.) & GAINES (R. C.). **Progress Report on Studies on Boll Weevil Control under South Carolina Conditions.**—*S. Carolina Agric. Expt. Sta.*, Bull. 223, 64 pp., 25 figs. Clemson College, S.C., June 1925. [Recd. December 1925.]

The following is taken from the authors' summary of this paper on *Anthonomus grandis*: —Calcium arsenate dust, applied after 10 per cent. of the squares were found to be punctured by the weevil, made 2·6 times the increase of seed cotton that was made with the Florida method [*R.A.E.*, A, xi, 73 ; xii, 209] ; 3·1 times that with one pre-square application of molasses mixture ; 1·6 times that with molasses mixture applied with both mop and sprayer ; and 2·2 times that with molasses mixture applied with a mop throughout the season. Early applications of molasses mixture and early applications of calcium arsenate dust, both of which were followed by calcium arsenate dust after 10 per cent. infestation, made practically the same increase of seed cotton as calcium arsenate dust applied after 10 per cent. infestation. One pre-square application of molasses mixture followed by calcium arsenate dust after 10 per cent. infestation made 2·8 times the increase of seed cotton that was made with one pre-square application of molasses mixture alone. One pre-square application of calcium arsenate dust followed by calcium arsenate dust after 10 per cent. infestation made 2·2 times the gain of seed cotton that was made with one pre-square application of calcium arsenate dust alone. Molasses mixture applied with both mop and sprayer, and nicotine dust made practically the same increase of seed cotton.

Glaser (R. W.). **Specificity in Bacterial Disease with Special Reference to Silkworms and Tent Caterpillars.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 769–771, 6 refs. Geneva, N.Y., December 1925.

Numerous experiments have been carried out for the purpose of comparing bacillary septicaemia in silkworms [*R.A.E.*, A, xiii, 462] with diseases produced by adding various species of bacteria to the food. Tent caterpillars [*Malacosoma*], which have proved very susceptible to the silkworm bacillus, were used in the experiments as well as silkworms. Mulberry leaves contaminated with seven species of bacteria were given as food, and each experiment was accompanied by a similar group of silkworms and tent caterpillars infected by adding the silkworm bacillus to their food. Among caterpillars fed normally none died. Those infected with the silkworm bacillus showed the usual high mortality among larvae and pupae ; those infected with the other bacilli showed only a few deaths, differing widely from those killed by the silkworm bacillus, and epidemics could not be initiated.

Alberts (H. W.) & Flint (W. P.). **The Effect upon the Vitality of Seed Corn of Temperatures that will kill Seed-infesting Insects.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 771–776, 10 refs. Geneva, N.Y., December 1925.

Maize infested with various common seed-infesting insects requires to be kept at a temperature of at least 125° F. for 3 hours in order to kill all stages. Such temperatures have no detrimental effects on the germinating power of maize where the moisture content of the maize is between 2 and 15 per cent., which is the usual condition in most seed stores. The maximum heat that may be applied to maize without injuring its vitality depends not only upon its moisture content at the time of treatment but also upon the previous storage temperature. The limits of moisture and temperature require to be further investigated.

Hamlin (J. C.) & Benton (C.), U.S. Bur. Ent. **Control of the Saw-toothed Grain Beetle in Raisins : A Preliminary Report.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 790–795. Geneva, N.Y., December 1925.

The problem of controlling infestations of *Silvanus* (*Oryzaephilus*) *surinamensis*, L. (saw-toothed grain beetle) in raisin packing-plants has two phases, namely, the reduction of existing infestation and minimising the risk of infestation during storage. The first process is to pass the raisins through a stemming machine, where the trash, consisting of sand, chaff and the small cap-stems, is removed and collected. This contains the great majority of the adult insects, and has been used in the past for roadway improvement or for manuring land. In either case, the insects disperse and enter packing and shipping rooms or fresh storage sacks, thus perpetuating infestation. The most effective action, therefore, aims at destruction of the beetles in the trash. Methods previously tried include burning, placing on city dumping grounds, burying at a distance, and fumigation at the plant in boxes beneath canvas with hydrocyanic acid gas or immediate and continuous fumigation in a trap-door hopper with calcium cyanide dust. The impracticability of the last two methods has been proved experimentally. A successful cupboard-like fumigatorium, however, has been designed and is described. Owing to the density of the material and the difficulty of retaining a heavy concentration of gas in such a structure, calcium cyanide in flake form is recommended, as it supplies a small amount of gas over a long period, and allows of application by hand. In this apparatus 20 oz. of fumigant per 100 cu. ft. gave successful results. The trash should be fumigated immediately it is produced, one fumigation, at night, being all that is required.

Stored fruit in heavily infested plants requires protection from yard infestation, and in this connection barriers have been devised, for use around the base of the open storage sheds, made of galvanised sheet-iron 18 in. wide, the upper 6 in. being rounded outwards to form a half-cylinder or bent at an angle of 20°. Their design is based upon the observation that movement of the adults is apparently restricted to crawling, despite the possession of fully developed wings, and that there is a tendency to crawl upward and to seek areas of less intensity of light. Of sets of 5,000 and 6,000 beetles used in experiments lasting for 24 hours, only a very few were found to have reached the edge of the concave surface, and in raisins inside the barrier at the end of the experiment two beetles only were found in the case of both arc and angle barrier. The protective value of the barriers seems to lie more in causing the beetles to come to rest in the shadow at the zenith of the concave or angle than in constituting an impassable obstacle.

SWEETMAN (H. L.). **The Life History of *Diabrotica vittata* Fabr. in Iowa. (Chrysomelidae, Coleoptera.)**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 795–807, 1 fig., 8 refs. Geneva, N.Y., December 1925.

Field and insectary studies of *Diabrotica vittata*, F. (striped cucumber beetle) in Iowa in 1924 and 1925 showed that it has two generations in a year. Beetles in captivity in June laid an average of 225 eggs, which hatched in about 8 days. The larvae fed for about 15 days and passed 5 days in a prepupal stage ; the pupal stage lasted one week, the adults mostly emerging in one day. Pairing occurred immediately, and oviposition began after 15 days. The average number of eggs laid by these females in August and September was 327 ; 8 days were required for incubation, 18 for feeding, 9 for the prepupal and 15 for the pupal stages, and 4 after transformation before emergence. A total of 51 days was required from egg to adult for this generation, that is, two weeks more than for the other. The hibernation stage has not been determined, but since a large percentage of the second generation emerges after the crop is harvested, clean cultivation and ploughing in autumn are suggested as remedies. Many cucurbits are attacked in parts other than the flower ; the leaves, silks and unripe kernels of maize are also infested, and the beetles have been recorded by others on the leaves and pods of beans and peas, leaves and fruit of apple trees, okra [*Hibiscus esculentus*], potato, etc.

HALEY (D. E.), OLSON (O.) & FOLLWEILER (F. L.). **Studies on *Nicotiana rustica* as a Source of a Nicotine for Insect Control.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 807–817, 9 refs. Geneva, N.Y., December 1925.

An investigation has been made to determine the rate of volatilisation of nicotine from ground *Nicotiana rustica*, which has been experimentally grown for insecticidal purposes [*cf. R.A.E.*, A, xii, 541], the entire dry weight of the plants, when mature, probably containing more than 5 per cent. of nicotine. The ground tobacco was used alone or with other materials, the rate of nicotine evolution being measured by the death rate or suspended animation of *Aphis brassicae*, L. (cabbage aphis) and other soft-bodied insects. The ground tobacco, when used alone or with water or basic lime compounds, was not efficient against Aphids. If sufficient quantities of basic materials were mixed with the ground tobacco, it was found that the addition of water resulted in the evolution of nicotine, the rate of nicotine volatilisation being increased by successive additions of water up to a certain point, further applications tending to lower the rate of volatilisation. Satisfactory control of currant worms, various Aphids, leaf-hoppers and many other insects was obtained with a 2 per cent. nicotine dust made up of ground tobacco, hydrated lime and water. A mixture of 5 parts tobacco, 5 parts hydrated lime and 3 parts water proved a very efficient insecticide under both laboratory and field conditions. In spite of the water present, this was applied to vegetation in ordinary power blowers without difficulty. Under the same conditions calcium oxide was not quite so efficient as hydrated lime in liberating the nicotine. Mixtures of ground tobacco, water and basic lime compounds can be kept in sealed containers for a relatively long period of time with no apparent loss of toxicity. The possibilities of cultivating this plant for insecticidal purposes are certainly worth further consideration.

PAINTER (H. R.), U.S. Bur. Ent., FLUKE (C. L.) & GRANOVSKY (A. A.). **Attractant and Poisoned Bait Experiments on the Pellucid Grasshopper.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 818–823. Geneva, N.Y., December 1925.

Experiments with grasshopper baits, using various materials as poisons and attractants, indicate that it is unnecessary to resort to elaborate mixtures against *Camnula pellucida*, Scudd. (pellucid grasshopper) under Wisconsin conditions. Salt or molasses, or a combination of the two, is apparently quite sufficient as an attractant. Crude arsenic, white arsenic and sodium arsenite seem to be equally effective as killing agents, the last-named being by far the most convenient for mixing in bait.

During the experiments about 50 per cent. of the larvae of *C. pellucida* were found to be infested with the Nematode, *Mermis nigrescens*, Dujardin.

HOUGH (W. S.). **Controlling *Pseudococcus comstocki* Kuw. on Catalpa.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 823–827. Geneva, N.Y., December 1925.

Following a biological study of *Pseudococcus comstocki*, Kuw. [*R.A.E.* A, xiii, 567], experiments have been made to devise some means of control. Egg-masses taken from *Catalpa bungei* were sprayed with lime-sulphur 1 : 7, which proved effective only on exposed eggs. Various oil sprays killed all eggs to a uniform depth of 1 mm. and some at a maximum depth of 3 mm. Calcium cyanide "A" dust [*R.A.E.*, A, xiv, 74] penetrated egg-masses to a depth of 9 to 12 mm. Carbolic acid (1 : 20) killed all eggs embedded in wax masses to a depth of 6 mm. but when diluted (1 : 50) did not penetrate more than 2 mm. Fish-oil soap (5 lb. to 3 U.S. gals.) did not penetrate any better than lime-sulphur. As some of the egg-masses on heavily infested trees were as deep as 20 mm., it was obvious that no ovicide could be effective unless the trees were first cleaned with a wire brush. One 6 in. long and ½ in. wide was most satisfactory, and careful pruning greatly facilitated cleaning out the centre of the head. After this cleaning, all the oil sprays applied as a dormant treatment were effective, and the lime-sulphur even more so, so that the first generation was reduced to harmless proportions. The third generation, however, again produced much foliage injury. In the summer six trees were banded with 8-in. burlap bands immediately below the first limbs, but the maximum number of adults that passed through the centre of the head of any one of the trees to oviposit beneath the bands was only 28 per cent. On heavily infested trees a survival of 10 per cent. of the females of the second generation was sufficient to start a third generation that could injure the foliage in August and September. Oil applications at this time scorched the foliage severely and killed only about 20 per cent. of the mealybugs. Calcium cyanide dusts "A" and "B" [*loc. cit.*] killed a large percentage, but severely injured the foliage; "B" dust diluted with lime was ineffective. Water at 250 lb. pressure knocked off about 95 per cent. of the mealybugs without damage to the trees, while hand cleaning as described above, at the time when the maximum number of females of the second generation were ready to oviposit, gave satisfactory control, leaving very few young on the leaves by late September.

WALTHER (E.). **The Pine Needle Mite, a new Enemy of the Pines, *Eriophyes pini* Nalepa, Family Eriophyidae.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 830–836. Geneva, N.Y., December 1925.

The mite, *Eriophyes pini*, Nal., is only known to occur in the United States in San Francisco and San Diego; it spreads very slowly, the only known food-plants being *Pinus radiata* and *P. torreyana*. Its feeding habits and the injury it does to the trees have previously been discussed [*R.A.E.*, A, xiii, 368]. There are apparently no internal parasites, but a larger mite of the genus *Seius* is predacious on it. Spraying experiments have been made with miscible oil (Calox), 20 per cent., making two applications in April, or lubricating oil emulsion, home-made, 10 per cent., one application in June. The first gave 95 per cent. mortality with no injury to the tree; the second 90 per cent. with very little injury, and this, being far cheaper, is recommended for use in the following way :—After 2½ lb. calcium caseinate has been dissolved in a little water, it should be added to a tank holding about 15 U.S. gals. water with the agitator running, and when it is well mixed 20 U.S. gals. heavy oil should be added, emulsifying well by playing the nozzle on the top of the water, and then adding enough water to make 200 U.S. gals. of spray, agitating all the while. Other oils tried were less satisfactory. It is not yet known what would be the effect of using this spray earlier, when the buds are opening in spring; it is possible that a weaker spray might then be sufficient. Spraying later than June reduced the numbers only temporarily. A high-pressure, large capacity sprayer is imperative to attain lasting effects on tall trees, and apparently even the best results from spraying can only be temporary, while the cost seems to warrant the treatment only in e case of valuable trees. If large forest areas are affected, the rly removal of infested trees might result in complete eradication undertaken promptly enough.

MITH (F. F.). **The Cicada Killer** (*Sphecius speciosus* **Dru.) in a peculiar Location and its Elimination with Calcium Cyanide.**— *Jl. Econ. Ent.*, xviii, no. 6, p. 836. Geneva, N.Y., December 1925.

The large sand wasp, *Sphecius speciosus*, Dru., which was present numbers tunnelling the beds in a formal garden in Philadelphia and lling many of the plants, was controlled by placing a teaspoonful of lcium cyanide in the opening of each burrow. [*Cf. R.A.E.*, A, xiii, 10, for a similar use of this remedy against *Vespula carolina*.]

RACKER (S. B.). **Hemlocks attacked by a little-known Geometrid.**— *Jl. Econ. Ent.*, xviii, no. 6, p. 837. Geneva, N.Y., December 1925.

Hemlock trees in Wisconsin were heavily infested in 1925 by the eometrid, *Ellopia fascellaria*, Gn., the trees being defoliated and many them dying as a result of the larval feeding. Pine, choke cherry d balsam are less heavily attacked. The larvae continued to do mage throughout July; pupation was apparently over about h September, and the moths were abundant on 19th and 20th Sep- mber. Empty pupal cases were found in crevices of bark and on aves on the ground. A closely related species, *E. somniaria*, Hulst, said to to have been injurious to hemlocks in British Columbia in 11–1913. Should the present outbreak continue into 1926, dusting y aeroplanes will be resorted to.

MITH (R. H.). **Codling Moth Eggs hatching under Water.**— *Jl. Econ. Ent.*, xviii, no. 6, pp. 837–838. Geneva, N.Y., December 1925.

In the course of an experiment in which the eggs of the codling moth *ydia pomonella*, L.] were used, it was found that the eggs continued hatch although completely submerged in water. The water was ithdrawn, and the larvae placed on an apple suspended by a thread. hough sluggish at first, their ability to burrow into the apple seemed be unaffected, though larvae falling on the surface of water usually rowned within a few hours. The observation shows that larvae are ot likely to be affected by heavy dew on apple trees, as has sometimes een thought.

LANDERS (S. E.). **A New Departure in Codling Moth Control.**— *Jl. Econ. Ent.*, xviii, no. 6, pp. 838–839. Geneva, N.Y., December 1925.

Within the last ten years the codling moth, *Cydia* (*Carpocapsa*) *omonella*, L., has become the most serious pest of walnuts in Southern alifornia. As a result thorough field inspection work has been under- aken, and between 15th July and 15th August every orchard is nspected in order to determine the infestation on each tree. Orchards howing an infestation of over 5 damaged nuts per tree are dusted with ead arsenate in the following year. Each year one dust application is ade within 10 days after the maximum oviposition, and 30 days after the maximum oviposition infested nuts are picked in those orchards having an infestation of over 15 per tree. The yearly cost of this work is estimated at from £2,000 to £3,000 in the district of Saticoy (Ventura County), where the value of the crop amounts to about £300,000. Since 1923, when the work was started, no increase in infestation has occurred.

Townsend (C. H. T.). **Cyanogas Calcium Cyanide for the Control of** *Atta sexdens* **L. in Brazil.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 840–842. Geneva, N.Y., December 1925.

For many years fumigation has been practised against the ant, *Atta sexdens*, L., in Brazil, but it has been almost impossible to use hydrocyanic acid gas, the best fumigant for the purpose, owing to the difficulties of applying it. The invention of cyanogas calcium cyanide two years ago has solved the problem of practical application, and this has been used by the author for the past two years with success and without ill effects. Full strength (Grade "A"), which contains about 48 to 50 per cent. calcium cyanide, should be used in finely powdered or dust form for application to the nests ; the cyanide of calcium dissociates rapidly in the presence of moisture, whereas other cyanides do so only slowly. The chemical reaction that takes place in the presence of moisture is described. This product is expected to supersede all other preparations as a formicide. The greater part of the hydrocyanic acid gas is formed immediately the calcium cyanide dust is blown into the nests, but the reaction continues for 24 to 48 hours until the process is complete, so that the tunnels are continually filled with the gas for sufficient time to kill all ants, both larvae and adults. It also kills the fungus on which the ants feed, either directly or indirectly by killing the ants that tend it, so that any larvae hatching from eggs that have escaped the fumes die from lack of food. Treatment for 10 minutes with a small duster will use about ½ lb. of the dust and is sufficient for small nests ; large, old ones with 100 or more openings may require 40 minutes and use about 2 lb. of the dust. The less a nest is disturbed before treatment the better will be the results. The largest holes should be treated first, all other holes from which the black cloud of smoke-like dust issues being closed up. The blower should then be worked in each hole that shows no cloud until distinct air pressure is felt. The best time for treatment is just before swarming time, which varies from September to December according to localities and conditions.

Wolcott (G. N.). **On the Amount of Food eaten by Insects.**—*Jl. Dept. Agric. Porto Rico*, ix, no. 1, pp. 47–58, 6 refs. Río Piedras, P.R., January 1925. [Recd. December 1925.]

In the course of experiments to determine the amount of food eaten by insects by direct measurement with individuals of various species, it was found that Lepidopterous larvae feeding on gramineous plants required 20 times their own dry weight in dry weight of food, while when feeding on other plants only 7 times their own weight is required, and that the same held good for Coleoptera with the similar feeding habits. Insects parasitic on other insects require only 5 times (or less) their own weight of food. It is not considered that these calculations can be used for determining the amount of damage used by insect pests to crops ; each insect is a special case, and re are numerous difficulties in determining the importance of any e that feeds exclusively on a single food-plant.

NRO (J. A.). **Notes on the economic relations of Kennicott's Screech Owl** (*Otus asio kennicotti*) **in the Victorian Region.**—*Canadian Field Nat.*, xxxix, no. 7, pp. 166–167, 1 ref. Ottawa, 30th October 1925.

A study of the stomach contents of 30 screech owls taken during e months of the year in the Victorian Region, British Columbia, gests that the local race shows a marked preference for an insect t. Species of Lepidoptera and Orthoptera known to be destructive agriculture were found in 12 stomachs and comprised 40 per cent. the insects eaten, the remainder being ground beetles, which are efly beneficial.

NN (M. B.). **Extract from "Forest Insect Conditions in Northern Ontario."**—*Canadian Field Nat.*, xxxix, no. 7, p. 162. Ottawa, 30th October 1925.

Woodpeckers are undoubtedly one of the major factors in the trol of the spruce bark-beetle, *Dendroctonus piceaperda*, Hopk. ly occasional trees are overlooked by these birds, and in these nense numbers of beetles mature. Woodpeckers' work apparently ins when the larvae are about half-grown and is carried on tematically until the remaining beetles emerge in the spring. On s infested in June, it begins about the middle of August, and bably reaches its height during the winter. All stages of the k-beetle are either devoured by the birds or knocked off the tree, n they generally die from exposure. By counting the tunnels de by the insect in a tree that was cut down and on which woodkers had been at work, and comparing the number of eggs that had bably been laid in each tunnel with the beetles that finally emerged, conclusion was reached that the birds—even allowing for other ses of mortality—had destroyed three-fourths of the total brood.

AINE (J. M.). **The Factors determining the Distribution of North American Bark-beetles.**—*Canad. Ent.*, lvii, no. 11, pp. 261–266. Orillia, Ont., November 1925.

he distribution of some of the North American species of the genus *idroctonus*, selected as typical of the SCOLYTIDAE, is given, with es on the limiting factors in each case. These factors are discussed l illustrated by instances from this genus.

he distribution of the host trees is the most important factor in distribution of bark-beetles, but there are others of considerable portance. *Dendroctonus simplex*, Lec., which is confined to *Larix ericana*, and *D. pseudotsugae*, Hopk., confined to *L. occidentalis* *Pseudotsuga*, appear to be found throughout the range of their t trees in the United States and Canada ; but for the fact that *udotsuga* and *Larix occidentalis* are not found where *L. americana* urs, it is probable that both of these bark-beetles would be found ll three trees. *D. valens*, Lec., breeds in pine and spruce throughout Canadian and adjoining zones, except where it is replaced by the ely allied species, *D. terebrans*, Oliv.

Climate is also an important factor in limiting distribution. *D. valens* is not found in the extreme northern part of the range of its food-plants; *D. frontalis*, Oliv., and *D. terebrans*, which breed in southern species of pine, occur also in the northern species, *Pinus strobus* and *Picea rubens*, where those trees extend into their region in Virginia and West Virginia; it is presumably the climate that prevents them from extending over the whole range of these northern trees. *D. monticolae*, Hopk., which is abundant in *Pinus monticola* and *P. ponderosa* in the western United States and southern British Columbia, and in *P. contorta* in the latter province, does not occur in *P. contorta* in its more northerly range. *D. johanseni*, Sw. [*R.A.E.*, A, viii, 192] has been found in white spruce [*Picea canadensis*] only at its extreme northern limit in Canada and Alaska, and in Ontario; it is the only species of *Dendroctonus* in the far north, although other bark-beetles were found associated with it. Climate also indirectly influences the distribution of some species of bark-beetles through determining the distribution of their host trees.

In some cases natural barriers affect the distribution of these beetles. *D. convexifrons*, Hopk., *D. arizonicus*, Hopk., and *D. approximatus*, Dietz, occur in western yellow pine [*Pinus ponderosa*] in the south-western United States, and have extended into Utah and Colorado, but have been prevented from spreading eastwards by the deserts on that side. *Ips knausi*, Sw., is confined to an isolated forest region in New Mexico. The barriers in these instances are caused by climatic conditions, with or without a resulting absence of food-plants.

Food habits and breeding habits also influence distribution in many species. Species that breed in either living or dead trees spread very rapidly; but *D. murrayanae*, Hopk., and *D. rufipennis*, Kby., require trees in a dying condition, and, probably for this reason, are not at all abundant. The number of eggs laid and the number of broods also influence the abundance, and consequently, to some extent, the distribution, of species. On several occasions large numbers of bark-beetles have been known to migrate over several miles of country, and short flights are not uncommon. This migrating habit greatly assists in distributing the species.

Parasites and predators have a marked effect in checking the increase of a few species of *Dendroctonus* and of many other bark-beetles. *D. pseudotsugae* and *D. simplex* are often heavily parasitised by Hymenoptera, and Clerid beetles destroy many adult bark-beetles during the short migrating season. Woodpeckers destroy large numbers of the larvae in standing trees, and appear to have had an important effect in reducing the outbreaks of *D. piceaperda*, Hopk., in certain districts [see preceding paper].

Artificial distribution of bark-beetles not infrequently occurs when large numbers of infested logs are brought into the neighbourhood of suitable host trees. Large numbers of fallen trees, or of trees killed by ground fires that have not greatly injured the bark enable the bark-beetles to multiply rapidly by providing an abundance of suitable food, and thus must influence their distribution.

VIERECK (H. L.). **Two New Canadian Ichneumonoidea.**—*Canad. Ent.*, lvii, no. 11, p. 278. Orillia, Ont., November 1925.

Campoplex (*Eulimneria*) *bakeri*, sp. n., from pupae of an iris pod borer, and *Opius* (*Chilotrichia*) *hyoscyamiellus*, sp. n., from *Pegomyia hyoscyami*, Panz., are described from Quebec.

ARCÍA (P. I.). **Ligeros Apuntes sobre la Biología del Gusano rosado del Algodon.** [Brief Notes on the Biology of the Pink Bollworm of Cotton.]—*Bol. Dirección Estudios biológicos*, iii, no. 1, pp. 1–11. Mexico, October 1925.

The pink bollworm, *Platyedra* (*Pectinophora*) *gossypiella*, Saund., as imported into Mexico in 1911 in cotton seed from Egypt; in 917 an investigation was made that resulted in the promulgation of ie existing regulations, which are, unfortunately, sometimes dis-garded. The present paper contains data collected by the author, ho was appointed in 1920 by the Mexican Government to study the ology of the pest in Mexico.

The majority of the eggs are laid in sheltered situations, the inner ırface of the boll-sheath being generally chosen. The exact number eggs per female could not be ascertained, as the results of oviposition captivity differ considerably from those indicated by dissection. In y surroundings adults lived for 4–20 days, and up to 36 in damp ones. he sexes are about equally divided. The egg-stage lasts 4–10 days, longer in some instances. Eggs flattened by pressure between ie boll and its sheath produce normal larvae. On hatching, the rva moves about actively, bores into the boll and begins feeding in a ed. If the larva has not reached full growth by the time it has nsumed the contents of a seed, it bores into an adjoining one without bandoning the original seed. About 11 per cent. of the seeds are thus ined together. The larva does not always bore into the boll; in any cases it bores into the flower-buds, and feeds on the stamens and ien on the ovary, which causes the small boll to rot and fall, the larva ıpating therein. Should the small boll fall before the larva has ached full growth it dies of starvation, but if the food-supply is used before the boll falls, the larva migrates to another. During the t season the larval stage lasts 14–17 days, but with the advent of ld weather there is a dormant period of 18 months or more. No orphological differences were seen between summer and winter larvae. llections of bolls made during the summer showed that only 70·71 per nt. of the larvae pupated and transformed into adults; 1·55 per cent. ed in the larval stage; 2 per cent. died in the pupal stage; and 5·74 per cent. entered the dormant stage. Under ordinary conditions ıpation lasts 10–12 days, but the period is prolonged in cold weather. he adult emerges in the early hours of night. It is in May and June hat the majority of the adults emerge from larvae from the previous ırvest, and these oviposit in the first bolls they find. There is, ierefore, an enormous advantage in using seed that will yield a crop ıickly so that the cotton may be out of danger at the date of the aximum occurrence of the pest.

EIVA (A.), COSTA LIMA (A.) & NAVARRO DE ANDRADE (E.). **Relatorio da Commissão Technica sobre a broca do Café** (*Stephanoderes coffeae*, **Hag.**). [Report of the Technical Commission on the Coffee Borer, *Stephanoderes hampei*, Ferr.]—*Comm. Estudo e Debellaçao da Praga Caféeira*, Pub. no. 1, 2nd edition, 11 pp. S. Paulo, 1925.

This report on the coffee-berry borer, *Stephanoderes hampei*, Ferr. *offeae*, Hag.), has already been noticed [*R.A.E.*, A, xii, 484, 501].

Busck (A.) & de Oliveira Filho (M. L.). **Da *Auximobasis coffeaella* Busck, mariposa dos fructos de café abandonados. Sua determinação e biologia.** [On *A. coffeaella*, a Moth infesting Coffee Beans lying on the Ground. Its Identification and Biology.]—*Comm. Estudo e Debellaçao da Praga Caféeira*, Pub. no. 13, 19 pp., 8 pls., 3 figs. S. Paulo, 1925.

The second part of this paper is a description by Busck in English of the Blastobasid moth, *Auximobasis coffeaella*, sp. n. The first part describes the biology of this species, first noticed in 1924 in abandoned coffee berries picked up from the ground in S. Paulo, Brazil. The females probably oviposit in the holes made by the coffee borer, *Stephanoderes* [*hampei*, Ferr.], or in cracks in the pericarp or endocarp. It is seldom that more than one caterpillar is found in a berry. Many of the larvae seem to pupate elsewhere than in the berries in which they have developed. During December to March the larval stage lasts from 25 to 35 days and the pupal 10 to 16. In April and May and in drier material development is slower. In the laboratory the females lived 18 days and the males from 6 to 10. Mating occurs 4 days after emergence. A certain degree of moisture is required in the berries. While the larva does not attack *S. hampei*, it displaces its eggs and larvae and disturbs the adults. The females of *S. hampei* leave the berries, and their progeny left in the berries perish because the caterpillars eat the food they would have used.

Bequaert (J.). ***Neotermes* injurious to living Guava Tree, with Notes on other Amazonian Termites.**—*Ent. News*, xxxvi, no. 10, pp. 289–294, 1 pl., 1 fig. Philadelphia, Pa., December 1925.

Termites are not very common in the region of the Upper Amazon, partly owing to the fact that large areas are completely inundated for several weeks every year. *Leucotermes tenuis*, Hagen, is probably the species that most commonly causes damage to houses in the Amazon valley.

At Manaós a colony of *Neotermes castaneus*, Burm., was found in a living guava tree (*Psidium guayava*). The galleries, which were made in perfectly sound wood, extended right up the tree into branches only 2 in. thick. The tree was sickly, but still growing, and was probably affected more by the numerous entrance holes that passed through the outer layers of the stem than by the internal galleries, which nowhere extended to the sapwood. It is very seldom that termites attack living tissues of plants, and all the known cases occur in the KALOTERMITIDAE, to which family *N. castaneus* belongs.

de Azevedo Marques (L. A.). **O "cupim," seus habitos e os meios de combatel-o.** [Termites, their Habits and the Methods for Combating them.]—*Bol. Minist. Agric., Ind. e Comm.*, xiv (ii), no. 3, pp. 392–394, 1 pl. Rio de Janeiro, September 1925. [Recd. December 1925.]

Leucotermes tenuis, Hag., is the most important termite in Brazil, and its various stages are figured. Carbolic acid, carbon bisulphide, benzine or essence of turpentine should be injected into the nests.

YAR (H. G.). **A New Corn and Boll Worm from Peru. (Lepidoptera, Pyralidae.)**—*Insecutor Inscitiae Menstruus*, xiii, no. 10–12, pp. 219–220. Washington, D.C., October–December 1925.

The Pyralid, *Jocarula agriperda*, gen. et sp. n., is described from eru, where it was reared from larvae taken with those of *Heliothis soleta*, F., from the tips of ears of maize and from cotton bolls. The tacked bolls develop prematurely, and this moth appears to be of nsiderable potential danger, especially if it should be spread by mmerce.

as moscas de las frutas y medios para su destrucción. [Fruit-flies and Means for destroying them.]—*Argentina*: *Minist. Agric.*, Circ. 527, 8 pp., 1 pl. Buenos Aires, 20th October 1925.

It is only in the north-eastern zone of Argentina that the occurrence fruit-flies has been noticed, the species concerned being *Anastrepha aterculus*, Wied. The text of a decree issued to guard against the troduction of the Mediterranean fruit-fly, *Ceratitis capitata*, Wied., given [*R.A.E.*, A, xiii, 491, 562]. *A. fraterculus*, *C. capitata* and *rosophila melanogaster*, Mg., are briefly described, with notes on their e-history and control.

incipales insectos que dañan los frutales de hoja caduca. [The Principal Insects injurious to Fruit-trees with Deciduous Leaves.] —*Argentina*: *Minist. Agric.*, Circ. 528, 38 pp., 6 pls. Buenos Aires, 20th October 1925.

The principal pests of fruit trees in Argentina are :—

Lepidoptera. *Cydia pomonella*, L.; *Hylesia nigricans*, Berg, an nnivorous native species with one annual generation, best combated collecting the egg-masses in winter and spraying with arsenicals spring; *Oeceticus kirbyi* var. *platensis*, Berg; *Coeculia* (*Clisiompa*) *proxima*, Burm., which has one annual generation and the rvae of which appear in September and feed on the foliage of pear nd other fruit-trees and should be combated with an arsenical spray; *itheronia regalis* var. *brissoti*, Boisd., which feeds preferably on the liage of the peach and pupates in winter in the ground (pupation ginning in March), and is combated by arsenical sprays and gging; and *Streblota bonaerensis*, Berg, which feeds on the foliage various trees, pupating in a cocoon attached to the bark of the ranches, and is checked by the collection of the pupae.

Coleoptera. *Scolytus* (*Eccoptogaster*) *rugulosus*, Ratz.; and *Steno- ntes spinibarbis*, L., the larvae of which can bore in the hardest oods, their presence being indicated by the withering of infested ranches.

Rhynchota. The Coccids, *Aspidiotus perniciosus*, Comst., *A. rapax*, mst., *Aulacaspis pentagona*, Targ., *Lepidosaphes ulmi*, L., *Epidiaspis ricola*, Del Guerc., and *Ceroplastes rusci*, L.; the Aphids, *Anuraphis rsicae-niger*, Smith, *A. helichrysi*, Kalt., *Myzus persicae*, Sulz., and *riosoma lanigerum*, Hsm.; and a Psyllid, *Psylla pyricola*, Först.

Other pests are a sawfly, *Caliroa* (*Eriocampoides*) *limacina*, Retz., e pear thrips, *Taeniothrips inconsequens*, Uzel; the mites, *Tetra- chus telarius*, L., *Bryobia praetiosa*, Koch, and *Eriophyes pyri*, ag., and the Nematode, *Heterodera radicicola*, Greef.

WINTERS (N. E.). **Manual para el cultivo del algodonero en la Repúblico Argentina.** [A Manual on Cotton Cultivation in Argentina.]—*Argentina: Minist. Agric.*, Circ. 539, 78 pp., 27 figs. Buenos Aires, 12th November 1925.

This is an amplification of a circular already noticed [*R.A.E.*, A, xii, 549].

The pests of cotton that were not there dealt with are the cutworms, *Agrotis ipsilon, A. c-nigrum, Sidemia* (*Hadena*) *devastatrix*, and *Lycophotia* (*Peridroma*) *margaritosa*; *Laphygma frugiperda*; the wireworm, *Monocrepidius vespertinus*; the mite, *Tetranychus telarius*; the Aphids, *Aphis gossypii* and *A. maidiradicis*; and the cotton-stainers, *Dysdercus sutureIlus* and *D. ruficollis*.

BRÈTHES (J.). **Nuestros benefactores anónimos de las plantas. Un nuevo insecto útil:** *Sigalphus primus* **Brèthes.** [Our unknown Friends of Plants. A new Beneficial Insect, *S. primus*.]—*Rev. Facultad Agronomía*, xvi, no. 1–2, pp. 57–63. Buenos Aires, 1925.

Beans infested by *Bruchus rufimanus* in Argentina were found to harbour a Braconid, *Sigalphus primus*, sp. n., of which a description is given, and which is evidently a parasite of the larvae of the Bruchid.

MILLAN (H. G.). **Contra la isoca de la alfalfa.** [Against the Lucerne Caterpillar.]—*Gaceta rural*, xix, no. 220, p. 357. Buenos Aires, November 1925.

This account of the life-history of the lucerne caterpillar [*Colias lesbia*] agrees substantially with one already noticed [*R.A.E.*, A, xii, 224]. The measure advocated in the case of a field of young lucerne is the use of a segment roller, which adapts itself to the irregularities of the ground. If the lucerne is in an advanced stage of growth, it should be cut rather early, and an ordinary roller then used over the mowings. In districts that are permanently infested, the lucerne should be cut in rows 10–12 yards apart. The caterpillars will then migrate to the uncut plants and can be destroyed there as described above.

JACKSON (T. P.). **Work Connected with Insect and Fungus Pests and their Control.**—*Rept. Agric. Dept., St. Vincent, 1924*, pp. 16–25. Trinidad, 1925.

The campaign against *Dysdercus delauneyi* (cotton-stainer) was continued vigorously during the year, the measures adopted being the enforcement of a close season for cotton, the trapping of the pest when found in numbers, and the destruction of its food-plants. The results in the last three years have been very satisfactory. The numbers of cotton-stainers captured each month have diminished rapidly since 1922, only just over 1 per cent. of the number taken in January 1922 being taken in January 1925, while none occurred for 6 months of 1924. The figures given refer to the Experiment Station, but apply fairly accurately to the whole Island. In addition to the food-plants previously recorded for *D. delauneyi* [*R.A.E.*, A, xi, 162], it has been found capable of existing for a considerable length of time on the flowers and fruit of pigeon pea [*Cajanus indicus*].

Fumigation of cotton seed and inspection of cotton ginneries, under e Cotton Protection Ordinance [*R.A.E.*, A, xii, 250] have been carried ut very thoroughly, and it is probably owing to this, and to the forcing of the close season, that *Platyedra gossypiella* (pink bollworm) R.A.E., A, xiii, 22] has not increased in the Island. Observations ere made at the Experiment Station to test the rapidity of the increase this pest when uncontrolled. Weekly counts of bolls from ecember 1924 to February 1925 showed that in that time the rcentage of infested bolls increased from 1 to 100. There are few tural enemies of *P. gossypiella*, but a small lizard was observed to t the larvae with avidity, and it is possible that the St. Vincent ackbird (*Quiscalus luminosus*) destroys some of the insects in the pen bolls and in seed cotton. *P. gossypiella* has not done serious amage in the Grenadines, but it has been necessary to prohibit the owing of Sea Island cotton in these islands.

A small outbreak of *Alabama argillacea* (cotton worm) again occurred the southern part of the island, this moth should be regarded as a otentially serious pest of cotton in St. Vincent.

Some apprehension is felt with regard to the red ring disease of oconuts, caused by the Nematode, *Aphelenchus cocophilus*; trees hat have been planted from 4 to 6 years are the most susceptible to his disease, and it is most essential that prompt measures should be aken when it appears. *A. cocophilus* flourishes best under moist onditions, and the particularly porous nature of the soil of St. Vincent ay prove an important factor in its control, though a series of very et years might have serious consequences. In view of the fact hat it has been asserted that attacks by the Hesperid, *Calpodes hlius* (arrowroot worm), do not have any marked effect on the yield arrowroot, experiments were made on several small plots to test he effect of stripping the leaves from the plants, this bringing about result similar to that produced by the larvae. This was done in ctober, and the rhizomes were harvested in the following February. he plots on which all the leaves were removed at once and those on hich they were removed in two instalments showed an increased ield as compared with the control, while those from which the leaves ere removed in four instalments showed a decreased yield. In some ocalities three separate outbreaks of *C. ethlius* occurred, but it is often ept in check by an egg parasite and by predacious birds. *Colaspis stidiosa* (bronze beetle) damaged young cotton plants, and was the ause of difficulty in establishing the crop. The minor pests of cotton nd other crops were the same as in 1921 and 1923 [*R.A.E.*, A, xi, 163; iii, 22]. Large numbers of *Laphygma frugiperda* (corn ear-worm) ppeared on grass and weeds in one locality in August, but quickly isappeared.

OPP (A.). **Rapport de l'Entomologiste et Phytopathologiste.**—*7ème Rapp. Sta. agron. Guadeloupe, 1924–25*, pp. 28–30. Pointe-à-Pitre, 1925.

The sugar-cane borer [*Diatraea saccharalis*] is largely kept in check y natural enemies, though it always causes damage to a certain proortion of stalks. It is generally only the young canes that are badly njured, or varieties with soft rind. The destruction of infested lips is most important; they are of little use, as their growth will be oor, and borers will spread from them to other plants. Dipping them in water at 140° F. removes insects, but is detrimental to germination. The use of green manure as a trap crop between the removal of the last shoots and the plantation of fresh cane would stop the borer from ovipositing on the young stalks. Experiments will be made of adding certain insecticides to Bordeaux mixture for disinfection of the slips. Parasitised eggs are sometimes found, but the parasites have not been reared; and two borer larvae have been observed attacked by a species of *Cordyceps*. *Diaprepes abbreviatus* is often found at the edges of the fields, but apparently does not attack cultivated crops so long as there is a supply of wild food-plants. *Pseudococcus boninsis* (*calceolariae*) is frequently found, but is of no great importance as a pest; it may possibly be concerned in the transmission of sugar-cane mosaic, but as it moves very little and does not pass from one branch to another its rôle as vector would be very limited.

Trinidad and Tobago: Minutes and Proceedings of the Froghopper Investigation Committee.—Pt. 1, 23 pp. Trinidad, December 1925.

This contains the minutes of the first meeting of the Committee that is investigating the froghopper pest of sugar-cane [*Tomaspis saccharina*] in Trinidad, together with reports by the Entomological, Soil Relations, and Agricultural Sub-committees, and a memorandum by S. F. Ashby on fungus control of the froghopper. These reports indicate the phases of the froghopper problem that are insufficiently known and outline the form that the investigations should take.

Notifications, nos. 1493, 1560, 1561 (Agri.).—*Govt. India Dept. Educat. Health & Lands*, 3 pp. Typescript. Delhi, November 1925.

Since 1st December 1925 cotton from America is not allowed to be imported into British India by post, and may only be imported through Bombay and between 1st November and 31st May in any year, full information regarding any consignment of cotton being given to the Collector of Customs in Bombay at least three weeks before the arrival of the ship. The cotton must be disinfected on arrival at the cost of the importer. These regulations do not apply to cotton seed or unginned cotton.

[FLETCHER (T. B.).] **List of Publications on Indian Entomology, 1924.**—*Agric. Res. Inst., Pusa*, Bull. 161, 41 pp. Calcutta, 1925.

The contents of this paper are indicated by its title, the publications being arranged under the authors.

HUSAIN (M. A.). **Report of the Imperial Entomologist.**—*Sci. Repts. Agric. Res. Inst., Pusa, 1924–25*, pp. 58–65. Calcutta, 1925.

Aphis sacchari was noted for the first time in fairly large numbers on sugar-cane at Pusa; *Trionymus* (*Pseudococcus*) *sacchari* and *Pseudococcus saccharifolii* were also present. *Eretmocera impactella*, usually a pest of *Amarantus* spp., occurred in large numbers on beet, and affected its growth. *Cosmophila indica* occurred on *Hibiscus esculentus*.

Thosea unifascia caused considerable injury to coconut palms in the Andamans; remedial measures consisted of cutting and burning leaves containing larvae, destroying the cocoons and collecting the ths at light traps. *Cirphis unipuncta* was reported from many alities in Bihar during December 1924. Various kinds of bands being tried for the control of *Monophlebus stebbingi* var. *octocaudatus* *R.A.E.*, A, xiii, 607]; *Brachytrypes portentosus* was controlled by uring petrol in the burrows; an outbreak of *Schizodactylus nstruosus* was effectively checked by the use of poison baits; and ude oil emulsion sprays have been tried against *Pyrilla* spp. on gar-cane. Observations on the lac insect and its natural enemies ve been continued, special attention being paid to the seasonal pearance of, and extent of attack by, *Eublemma amabilis*.

SAIN (M. A.). **Annual Report of the Entomologist to Government, Punjab, Lyallpur, for the Year ending 30th June, 1924.**—*Rept. Dept. Agric. Punjab, 1923–24*, Part II, vol. i, pp. 55–90. Lahore, 1925.

Laphygma exigua, Hb., is recorded for the first time from the Punjab attacking cotton. The collection and destruction of rolled leaves suggested for the control of *Sylepta derogata*, F., attacking this crop. e results of rope-dragging experiments for the control of *Earias* licate that this is an effective method of removing attacked bolls, t further observations are needed to ascertain the percentage of ll-worms thus destroyed. The various species of the genus occurring Lyallpur are *E. insulana*, Boisd. [*cf. R.A.E.*, A, xii, 90]; *E. fabia*, oll, the larvae of which were collected on hollyhock in July, on *biscus esculentus* from April to June, and on cotton flower-buds in ptember; and *E. cupreoviridis*, Wlk., bred from larvae on pods of *esculentus* in May.

The larvae of *Platyedra gossypiella*, Saund., are recorded for the first me as actually feeding on flowers of hollyhock. Some of the larvae n apparently remain in the resting stage for more than one year, but tempts to breed this species in the laboratory were not successful. rasites bred from the larvae include Braconids belonging to the nera *Chelonus*, *Apanteles* and *Bracon*, and a Chalcid, *Elasmus* sp.

Larvae of *Sphenoptera gossypii*, Kerr., were found on cotton sticks om April to June, and the adults on hollyhock leaves in May. The gs are laid singly on the stalks of cotton near the ground level, and ese should be destroyed by burning before the adults emerge from em. The caterpillars of *Tarache notabilis*, Wlk., *T. nitidula*, F., *marmoralis*, F., and *T. opalinoides*, Guen., attack the leaves of tton. The larvae and moths occur in the field from May to August, hen the larvae enter the soil for pupation. The total life-cycle of *notabilis* in 1923 and 1924 under laboratory conditions lasted from to 32 days; some of the individuals that pupate in June, however, bernate as pupae, the adults emerging in May, making a life-cycle of months. Other pests of cotton are *Acontia graellsi*, Feisth.; *uproctis fraterna*, Mo.; *Phycita infusella*, Meyr., which, under labora- ry conditions, hibernated as a larva; *Myllocerus blandus*, Fst., hich causes considerable damage every year; *M. undecimpustulatus*, st., common throughout the season; *Alcides affaber*, Fst., recorded r the first time from Northern India; *Dysdercus cingulatus*, F.; *xycarenus laetus*, Kirby; and *Pseudococcus corymbatus*, Gr., observed n a single isolated cotton plant in October. *Bracon kitcheneri*,

D. & G., is a parasite of *Phycita infusella,* and many other hosts, including *Heliothis obsoleta,* F., and *Agrotis* sp.

Observations on moth borers attacking sugar-cane, etc., are being continued. *Sesamia* spp. are the first to emerge from hibernation; these are followed by *Diatraea auricilia,* Dudg., and *Chilo simplex,* Butl., *Emmalocera* sp. always appearing last. *Scirpophaga* spp. generally appear early, so that, like *Sesamia,* they usually emerge before the young cane is in the fields. *C. simplex* is mainly found in maize and *Sorghum,* whilst the insects damaging sugar-cane are *D. auricilia, Emmalocera* sp., and *Scirpophaga* spp. The destruction of the borers in the stubble appears to be the most satisfactory remedial measure, and when it was buried at depths varying from 6 inches to 2 feet none of the adults emerged. *Pyrilla* spp., causing considerable damage to sugar-cane, have been controlled by the collection of the eggs and adults.

A detailed study has been made of the life-history of *Aulacophora abdominalis,* F. (red pumpkin beetle), attacking melons and other cucurbits. The adults emerge from hibernation about the end of March, when these plants are just germinating, and a large number of young seedlings are destroyed at this time as the result of defoliation. The total life-cycle occupies about 40 days, there being four or five generations a year. The second generation is less injurious than the first. The larvae feed on rotten leaves, shoots and roots, and may cause the death of the plants, though they are less injurious than the adults. Good results were obtained against this pest by sprinkling the plants with either lead arsenate or Paris green mixed with ashes, lime or road dust, 1 : 10.

The larvae of the Cucujid, *Silvanus surinamensis,* L. (saw-toothed beetle), infested stored melon-seed kernels at Lyallpur. The eggs hatch in 5–6 days in the summer, and the larvae are full-grown in about 38 days. The pupal stage lasts about 8 days. The whole life-cycle varies from 35 days in May–July to 62 in August and September.

Vegetable pests include *Eublemma olivacea,* Wlk., the egg, larval and pupal stages of which last 3–4, 19–21 and 8–10 days respectively, the moths being common on egg-plants [*Solanum melongena*] in August and September; *Euzophora perticella,* Rag., abundant on egg-plant shoots in June and July; *Leucinodes orbonalis,* Gn., found feeding on pods of green peas in April, hibernation occurring in a cocoon under laboratory conditions during January and February, and pupation lasting 6–8 days in May, June and September; *Pieris brassicae,* L., causing serious damage to cauliflowers and cabbages; *Bagrada picta,* F., the life-cycle of which lasts from 14 to 18 days; and *Nezara viridula,* L., with a total life-cycle of 81 days.

MALIK SULTAN ALI. **Annual Report of the Gurdaspur Agricultural Station for the Year ending 30th June, 1924.**—*Rept. Dept. Agric. Punjab, 1923–24,* pt. 2, vol. ii, pp. 1–45. Lahore, 1925.

In view of the serious damage caused to seedling sugar-cane by termites, various deterrents were tried at the time of sowing. The sets were treated with solignum, kerosene oil, and crude oil emulsion, and kerosene oil was sprayed in the furrow before putting the sets in. The last two gave the best results. Attacks by cane borers began about the middle of March and continued to the end of June, the moths concerned belonging to the genera *Diatraea*, *Emmalocera*, *Scirpophaga*, and *Chilo*. The first of these bores the shoot and generally remains above ground level, while the second bores down into the roots and is, therefore, more difficult to control. The others are of less importance, *Chilo* appearing late in the season. Tables are given showing the percentage of borer attack before and after the removal of dead hearts, and also the satisfactory results obtained by the use of a light trap during May and June, 1924.

McKerral (A.). **Report on the Operations of the Department of Agriculture, Burma, for the Year ended the 30th June, 1925.**—34 pp. Rangoon, 1925. [Received January 1926.]

In the course of this report a very brief chapter is devoted to the insect pests recorded during the year under review. A certain amount of minor damage was caused to rice by the rice case-worm [*Nymphula depunctalis*, Gn.] and the rice hispa [*Hispa armigera*, Ol.]. During March the bean crop was severely attacked by *Diacrisia obliqua*, Wlk. (hairy caterpillar), which was also a serious pest of tobacco in certain districts.

The Coffee Borer.—*Planters' Chron.*, xx, no. 47, pp. 857–860. Madras, 21st November 1925.

This is a brief summary of papers concerning *Xylotrechus quadripes* (coffee borer); much of the information has already been noticed in this *Review*.

F. T. **Cultivation of Lac in the Khasi Hills, Assam.**—*Indian Forester*, li, no. 12, pp. 614–615, 1 pl. Allahabad, December 1925.

In the Khasi Hills, Assam, while *Cajanus indicus* is used for the production of summer and rains broods of lac, a wild herbaceous shrub, *Leea crispa*, is also used to yield an autumn crop. This is a fairly common plant and is easily propagated. Another wild plant, *Flemingia congesta*, yields both rains and winter broods, and is used alternately with *Leea*. The lac grown on these herbaceous plants is not, however, of so good a quality as that obtained from the more usual woody food-plants.

Nicholson (J. W.). **Some Notes on Lac Cultivation.**—*Indian Forester*, li, nos. 10—12, pp. 483–498, 553–564 & 605–614. Allahabad, October, November and December 1925.

These notes were compiled by the author (largely from information that could not be verified) during the course of a three years' investigation into the position of the lac industry in Bihar and Orissa, with a view to determining the possibility of extending the cultivation of lac both inside and outside the Government forest areas. The factors governing the successful cultivation of lac are discussed, the present methods of cultivation are described, and certain possible improvements that have been suggested are dealt with. Numerous brood lac farms have recently been sanctioned by the local government, and it is thought that, whatever efforts are made in other regions, Bihar and Orissa, Western Bengal and parts of the Central Provinces will always remain the centre of the industry, largely because the experience of the growers has been accumulated through many generations; and the present yield could be multiplied several times if there was sufficient brood to utilise all the available food-plants.

HUTSON (J. C.). **The Paddy Swarming Caterpillar.**—*Dept. Agric. Ceylon,* Leaflet 32, 2 pp., 1 pl. [Peradeniya, 1925.] [Recd. January 1926.]

A brief and popular account is given of the life-history and control of the paddy swarming caterpillar [*Spodoptera mauritia,* Boisd.] in Ceylon [*R.A.E.*, A, ix, 10].

HUTSON (J. C.). **The Tea Tortrix.**—*Dept. Agric. Ceylon,* Leaflet 33, 1 p., 1 pl. [Peradeniya, 1925.] [Recd. January 1926.]

This is a brief and popular account of the life-history of the tea tortrix [*Homona coffearia,* Nietn.] in Ceylon. The collection of egg masses is recommended, and in less serious attacks, or where the affected area is small, the damaged leaves may be picked and burnt immediately. Where the attack covers a large area, the bushes may be "tipped" or top-pruned and the prunings burnt.

[HUTSON (J. C.).] **Ceylon Entomology.**—*Trop. Agriculturist,* lxv, no. 5, p. 303. Peradeniya, November 1925.

In an outbreak of *Heterusia cingala,* Moore (red slug) that occurred on tea in one district, a large number of the larvae were found to be parasitised by a Tachinid. *Gracilaria theivora,* Wlsm. (tea leaf-roller) occurred on a few estates. *Aularches miliaris,* L. (spotted locust) damaged tea on one estate, after completely defoliating the interplanted dadap trees [*Erythrina*] over a large area. Other pests recorded include the Pyralid, *Marasmia bilinealis,* Hmps., and the Lasiocampid, *Lenodora vittata,* Wlk., both of which caused small outbreaks on rice.

BARNES (W. H.) & SOUTH (F. W.). **The Padi Fly** (*Leptocorisa* **spp.**) **in Kuala Pilah District.**—*Malayan Agric. Jl.,* xiii, no. 11, pp. 351–355. Kuala Lumpur, November 1925.

A good deal of the information contained in this paper regarding *Leptocorisa* spp. has been previously noticed [*R.A.E.*, A, xi, 532], additional species recorded from Malaya being *L. lepida,* Bredd., and *L. corbetti,* China. The bugs were extremely numerous in one district of Negri Sembilan during the rice harvest of 1924, some of the crops being almost entirely destroyed. In this district several varieties of rice maturing at different times are grown, and planting continues over 5 or 6 weeks, so that there is food for two consecutive generations. Apparently the last generation maturing in 1923–24 survived without ovipositing until the next year's rice provided a suitable supply of food, when oviposition began. Early in 1924–25 the bugs were so numerous that it was realised that without a co-operative campaign there would be no rice crop at all, and practically the whole native population of the ricefields undertook remedial measures. The chief method employed was the collection of the insects on various simple pieces of apparatus on which was spread a sticky mixture. Where large numbers of adults were present, a piece of old casting net, 2 ft. by 1 ft., was stretched at one end of a bamboo 6 or 8 ft. long and was waved among the flying insects over the tops of the flowering rice-plants on which they had settled. The sticky substance was generally made of Keruing oil mixed with some wild rubber from the jungle. Where nymphs occurred in numbers they were shaken off the heads of rice into pans of water containing the juice of limes and wood ashes or a little kerosene oil. The eggs, which were not found until the majority of the adults had been destroyed, were collected and were placed for preference in a tin standing in a dish containing a little water and kerosene oil. This ensured the death of larvae that hatched and the liberation of any Hymenopterous parasites present. The results from this co-operative action were very satisfactory. A few insects seemed to be attacked by a fungus, a species of *Hirsutella*, but this was too scarce to exercise any appreciable measure of control. Where permanently irrigated areas are in question, varieties of rice flowering at about the same time should always be used ; every effort should be made to destroy the bugs when they first appear in small numbers ; grasses should be cleared from the edges of ricefields ; and swarms found after harvest in rubber areas, jungle, etc., should be destroyed.

SHINODA (O.). **On the Biochemistry of the Wild Silk-moth,** *Dictyoploca japonica*, **Moore. 1. Chemical Development in the Growth of the Wild Silk-moth.**—*Mems. Coll. Sci. Kyoto Imp. Univ.*, Ser. A, ix, no. 3, pp. 225–235. Kyoto, 1925.

The contents of this paper are indicated by its title.

MURATA (J.) & IKEDA (T.). **A new Pest of** *Salix*.—*Jl. Plant Protect.*, xii, no. 12, pp. 663–668. Tokyo, December 1925. [In Japanese.]

The Geometrid, *Abraxas sylvata*, Scop., var. *miranda*, Butl., has two generations a year, the adults appearing in May and again in July or August. They are diurnal in habit and oviposit on the upper surfaces of the leaves. The egg stage lasts about 12 days. The larvae feed on the leaves of *Salix, Populus, Ulmus*, etc., and moult four times, pupating in the ground about 27 days after hatching. Hibernation occurs in the pupal stage.

KURATA (U.). **A Dipterous Pest found in the young Shoots of Bamboo imported from Formosa.**—*Jl. Plant Protect.*, xii, no. 12, pp. 674–677. Tokyo, December 1925. [In Japanese.]

An account is given of the Trypetid, *Gastrozona macquarti*, Hendel, which was bred at Kobe from larvae in young shoots of bamboo imported from Formosa in May 1925.

OTANES (F. Q.). **Soap as an effective Contact Insecticide for the Philippine Migratory Locust.**—*Philipp. Agric. Rev.*, xvi, no. 4, pp. 281–286. Manila, 1923. [Recd. December 1925.]

Experiments with a soap spray against locusts [*Locusta migratoria*] [*R.A.E.*, A, xii, 525] are described ; and the text of a circular giving instructions for its employment is reprinted.

Administrative Orders, nos. 29-35, 37. Philippine Bur. Agric.—*Philipp. Agric. Rev.*, xvii, no. 1, pp. 52–71, 73–74. Manila, 1924. [Recd. December 1925.]

Order no. 29 gives the revised regulations governing the importation and exportation of plant materials in general to and from the Philippines.

Order no. 30 prohibits the importation of plants of the genus *Musa*, or any unmanufactured parts of such plants, on account of pests, except for such plants as may be allowed entry in order to secure better varieties for cultivation.

Order no. 31 deals in the same way with coconut plants; Order no. 32 with sugar-cane; Order no. 33 with rice; Order no. 35 with pineapples; and Order no. 37 with tobacco plants. Order no. 34, directed against *Ceratitis capitata*, gives a list of 69 fruits the introduction of which into the Philippines is prohibited from Spain, France, Italy, Sicily, Greece, Malta, Asiatic Turkey, Egypt, Tunis, Algeria, Cape Colony, Natal, British East Africa, Madagascar, Brazil, Argentina, the Bermudas, Hawaii, and Australia, except the States of Tasmania, South Australia and Victoria. Importation from these States is permitted with accompanying certificates.

OTANES (F. Q.). **Some Observations on Root Grubs** (*Leucopholis irrorata*, **Chevr.) in the Philippines and Suggestions for their Control.**—*Philipp. Agric. Rev.*, xvii, no. 2, pp. 109–119, 3 pls., 7 refs. Manila, 1924. [Recd. December 1925.]

During 1923 a serious outbreak of root grubs occurred in various localities of the Philippines. The beetle concerned proved to be *Leucopholis irrorata*, Chevr., attacking sugar-cane, upland rice, mango and other seedlings. This is the first record of this Melolonthid from the Philippines as a serious pest of sugar-cane, though it is widely distributed throughout the islands. Both the larvae and adults are polyphagous, and a list of their numerous food-plants is given.

Injury to sugar-cane is first noticed in the latter part of September, when a large percentage of the cane wilts owing to attacks at the root. Parts of the stem may also be eaten by the larvae. Although the adults feed on the leaves of mango and other trees, the damage done is not serious. Observations on the life-history are incomplete, but indicate a life-cycle of about a year. During April to June only pupae could be found, pupation in most cases occurring in the subsoil. The adults remain in the soil for some time after emerging from the pupa, this period probably depending on the amount of rainfall. During the day they are inactive and may generally be found clinging on the leaves and twigs of trees, from which they can easily be collected by shaking. Collection by hand is also the best method of dealing with the larvae and is especially recommended in sugar-cane fields where ratooning is rarely if ever practised. The larvae are easily picked up as they are exposed by the plough, and in gardens, nurseries and orchards they may be dug up, or carbon bisulphide, 1 to 4 cc. to each plant, may be injected at depths of 3 to 4 inches. Carbon bisulphide should not be applied to seedlings before they are firmly rooted, or immediately after watering or when rain is expected to follow the application, as excessive moisture in the soil retards the formation of the gas, thus reducing the efficacy of the material and increasing its liability to injure the plants.

GODDARD (E. J.). **Bunchy Top in Bananas. Cause and Nature of Disease. Report of Investigation Committee.**—*Queensland Agric. Jl.*, xxiv, pt. 5, pp. 424–429. Brisbane, 1st November 1925.

This is the preliminary report of the committee appointed by the Governments of Queensland, New South Wales, and the Commonwealth of Australia to investigate the " bunchy top " disease of bananas.

As a result of experiments in the field, it appeared that this disease is transmitted by *Pentalonia nigronervosa*, Coq. (banana aphis). This was proved by further experiments carried out under controlled conditions in an insect-proof greenhouse.

From negative results of microscopical examinations of bananas affected with bunchy top, and from the nature of its effects on the plant tissues and its course in them, it is concluded that bunchy top is a disease of the virus type. Negative results have so far attended attempts to transmit the disease by direct inoculation of the sap, and it is not yet known whether any insects other than *P. nigronervosa* are capable of carrying the infection.

In lightly affected areas a careful weekly inspection of every plant should be carried out, and if the disease is observed, the diseased bananas and the soil surrounding them should at once be sprayed thoroughly with nicotine sulphate, in order to kill any Aphids present, after which the plants should be dug up and cut into pieces. It is essential that the whole of a diseased plant should be destroyed, not merely those parts that show symptoms of disease. If the nature of the ground precludes the possibility of digging up diseased plants, they should be cut down and the roots should be killed by treating with kerosene. Suckers for starting plantations should be obtained from districts where the disease is unknown, not merely from apparently healthy plants; they should not be planted in ground from which infected plants have been removed, as it is not yet known whether the virus can persist through several generations of Aphids. If the bananas are planted in rows 12 ft. apart, with 12 ft. between each plant, the spread of the Aphids will be hindered. It is thought that the above measures will prove effective in the districts where the disease is not yet serious, but they are not practicable for application in most cases in heavily affected areas, where, owing to the existence of deserted plantations, it is exceedingly difficult to remove all the sources of infection. Experiments in spraying and dusting for the control of the disease by destroying the Aphids have not so far given very promising results, but these are being continued. Tests of possible resistant bananas have given no positive results.

BURNS (A. N.) & MUNGOMERY (R. W.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxiv, pt. 5, pp. 443–444. Brisbane, 1st November 1925.

Laboratory tests with the proprietary insecticide " Chlorocide " as a soil fumigant against *Lepidoderma albohirtum*, Waterh. (grey-back cane beetle) showed that third stage larvae are killed in 5 days by applications of 15, 20, and 30 grains to 10 cu. in. of soil. The small amounts were as effective as the larger. The effect on the first day was to stimulate the larvae to greater activity, and it is thought that under field conditions they would possibly be able to burrow out of reach of the effects of the fumigant. This substance evaporates slowly in the soil, and it may prove a useful deterrent against oviposition.

During October the pupae of *L. albohirtum* change to imagines inside the pupal cells, which may be found in the earth at depths varying from 9 to 24 in., according to the nature of the subsoil; the beetles are thus ready to emerge in November after the first heavy rain. About six weeks after the emergence of the first beetles, when the young larvae are feeding on the finer roots, and before the beginning of the wet season, is the best time to apply soil fumigants, such as paradichlorobenzene.

Phragmatiphila truncata, Wlk. (sugar-cane moth borer) has been very prevalent on sugar-cane in Northern Queensland. It is generally most abundant close to headlands, and in young cane where trash has been left lying in the fields. The injury by the larvae of this moth is similar to that of *Rhabdocnemis obscura*, Boisd. (beetle borer), but is mostly confined to the central tender part of the stem, in young ratoons and shoots, while the latter almost invariably attacks mature or almost mature canes, and may bore throughout their entire length. The larval stage of *P. truncata* lasts only a few weeks; pupation takes place in a cell constructed inside the cane stem, at a point where the latter is soft, thus making the emergence of the moths easy. The length of the pupal period varies according to the season, being 16 or 17 days in October.

BENSON (A. H.). **Destruction of Insect and Fungus or Fungoid Pests. A Comparison of Methods.**—*Queensland Agric. Jl.*, xxiv, pt. 5, pp. 465–467, 1 fig. Brisbane, 1st November 1925.

This is a discussion of the relative merits of spraying, dusting, and fumigation for the control of pests and diseases of plants. In Queensland the difficulty and cost of obtaining water for spraying is often very considerable. For this reason dusting has recently been employed for the control of fruit pests, and has proved very satisfactory against mites, thrips, and leaf-eating insects. A further advantage of dusting is that very little labour is needed in its application, and the apparatus required is easily portable. Spraying is, however, essential in the case of contact insecticides, especially for sucking insects, though tent fumigation with hydrocyanic acid gas derived from powdered calcium cyanide is the most effective control for them.

PERROTT (W. H.). **A Spray for Citrus Trees.**—*Rhodesia Agric. Jl.*, xxii, no. 9, pp. 970–971. Salisbury, December 1925.

A spray consisting of 1 gal. lime-sulphur, 9 oz. 40 per cent. nicotine sulphate, 7 oz. universal spreader or 1½ to 2 lb. sifted maize meal, and 100 gals. water is recommended for general use on *Citrus* trees during the blossoming period and up to the time the fruit is the size of hazel-nuts. It prevents the attack of thrips, Aphids and *Heliothis* (*Chloridea*) *obsoleta*. As a result of its application, a grove was rendered free from *H. obsoleta* within 4 days. The spray is in no way harmful to the blossom or the setting of the fruit, even when as much as 5 gallons have been applied to 10-year-old trees. The cost is about £4 10s. per 1,000 gallons of diluted solution.

Mr. R. W. Jack, in discussing this formula, suggests the advisability of further investigations and states that the spray must be used with considerable care when the fruit is on the trees, as it is apt to blemish it.

POMEROY (A. W. J.). **The Relative Importance of Insect Damage as a Factor in inhibiting the Production of Cotton in Southern Nigeria.** —*Empire Cotton Growing Rev.*, iii, no. 1, pp. 36–39. London, January 1926.

A survey of cotton growing in Southern Nigeria with a view to the development of the industry leaves little doubt that American varieties of cotton are more intensely affected by insect damage than the native ones, though the latter are more easily affected by fungus and bacterial diseases. Both laboratory and field experiments proved that American cotton exerts a greater chemotropic action on insects generally than indigenous varieties, and there is greater migration of *Dysdercus* spp. to American cotton than to native when both are grown side by side, probably owing to the greater intensity of the flowering periods of American cotton and the more succulent nature of the bolls. Bollworms, however, frequently damage native cotton more than American, largely on account of the longer developmental period ; these slow-growing cottons must, therefore, show a greater degree of immunity or an adequately compensating lint value to render their cultivation worth while. On the whole, the native varieties do not seem to exhibit these features ; a strain might be developed, by careful selection, that would be an improvement on the present, but unless an area was exceptionally well controlled and local strains eliminated, the improved variety would probably revert to the established type. Moreover, the native varieties are grown as perennial crops, thus preventing any control of insect pests, while with American varieties the rate of growth is so rapid that a close season can be enforced. The possibilities of growing such an American or exotic variety by the natives is discussed, and it is suggested that if the basic measures that have been found effective in other countries are found applicable, the experiment would be worth trying in Southern Nigeria.

GAHAN (A. B.). **Interesting Records of Two little known Parasitic Hymenoptera.**—*Proc. Ent. Soc. Wash.*, xxvii, no. 9, p. 188. Washington, D.C., 24th December 1925.

The species dealt with are the Pteromalid, *Paracarotomus cephalotes*, Ashm., from puparia of a Syrphid fly, *Paragus* sp., in S. Nigeria, and the Proctotrupid, *Telenomus nawaii*, Ashm., from the eggs of *Prodenia litura*, F., in Fiji.

FONT DE MORA (R.). **Nuevo método de fumigación por el líquido acido cianhídrico, su aplicación al naranjal y efectos sobre las plagas.** [A New Method of Fumigation with Liquid Hydrocyanic Acid, its Application in Orange Plantations and its Effect on Pests.]—*Bol. Agric. téc. y econ.*, Sección doctrinal, xvii, no. 203, pp. 441–452, 1 fig. Madrid, 30th November 1925.

Fumigation with hydrocyanic acid gas against citrus pests was introduced into Spain in 1907 and is now a matter of current practice. This article describes the use of this fumigant in the liquid and dust (calcium cyanide) forms.

LEONARDI (G.). **Elenco delle specie di Insetti dannosi e loro parassiti ricordati in Italia fino all'anno 1911.** [Catalogue of Harmful Insects and their Parasites recorded in Italy to the Year 1911.] Part II. Fasc. 2 (Continuation and End).—*Ann. R. Scuola sup. Agric. Portici*, Ser. 2, xx, 81 pp. Portici, 1925.

This is the concluding portion of a list of which previous parts have been noticed [*R.A.E.*, A, xii, 105; xiii, 57].

SILVESTRI (F.). **Problemi di entomologia agraria.** [Problems of Agricultural Entomology.]—*Atti Soc. ital. Progr. Sci.* (13th Meeting, Naples, April–May 1924). Separate, 15 pp. Pavia, 1924. [Recd. January 1926.]

This address to the Italian Society for the Progress of Sciences reviews the various problems of agricultural entomology such as artificial control, natural control, the influence of weeds, the occurrence of stocks immune from infestation, plant pathology, meteorology and cultural practices.

SILVESTRI (F.). **Etat actuel de la lutte contre la Mouche de l'Olive; Excursion et observations faites à Corfou; Observations.**—*C. R. Trav. 6ème Congrès internat. d'Oléicult., Nice, 14–19 Octobre 1923*, pp. 48–77, 78–83 & 159–162. [*sine loco*, n.d.] [Recd. January 1926.]

The first of these papers presented at the Congress held at Nice in October 1923 [*R.A.E.*, A, xii, 37] is identical with the report presented to the International Institute of Agriculture in Rome [x, 252]. In the second, the author describes visits to Corfu in 1921. He is still doubtful of the value of the artificial control methods against *Dacus oleae* advocated by Berlese, and he gives a parallel statement of the two opposing views on this question.

ZWÖLFER (W.). **Eine Polyederseuche als Ursache des Erlöschens einer lokalen Goldafterkalamität.** [A polyhedral Epidemic bringing to an end a local Outbreak of the Brown-tail Moth.]—*Die kranke Pflanze*, ii, no. 12, pp. 239–240. Dresden, December 1925.

After a severe local outbreak of *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*), involving defoliation of ash and other trees in Dresden in spring and summer, no pupae, adults and winter nests could be found in autumn. An examination of dead caterpillars showed them to be infected with polyhedral bodies, and these appear to have been responsible for the stamping out of the outbreak.

ZILLIG (H.). **Schwere Schäden durch den Hausbock** (*Hylotrupes bajulus* **L.**) **an Starkstrommasten.** [Severe Damage to Electric Power Cable Posts by *H. bajulus*.]—*Anz. Schädlingsk.*, i, no. 12, pp. 134–137, 4 figs. Berlin, 15th December 1925.

An article on this subject has already been noticed [*R.A.E.*, A, xiv, 35]. Impregnation with tar-oil (creosote) is the only measure that protects posts against infestation by *Hylotrupes bajulus*, L. The female deposits eggs in cracks in the posts. The larvae hatch in a few days and bore mines, usually vertical, about a quarter of an inch in diameter, chiefly in the sapwood. A log about 19 inches long and 6 inches in diameter was found in March to contain about 20 larvae. Logs kept until early August produced 9 females and 6 males between 5th July and 10th August. No pupae were noticed. Mating occurs immediately after emergence from the log, and oviposition follows in 1 or 2 days. The few exit-holes are the only visible sign of infestation.

WIMMER (E.). **Eine Blattwespe als Eichenschädling.** [A Sawfly as a Pest of Oaks.]—*Anz. Schädlingsk.*, i, no. 12, pp. 137–139, 4 figs. Berlin, 15th December 1925.

In 1924 one- and three-year-old oaks at Giessen were attacked by a sawfly, *Caliroa annulipes*, Kl., the larvae of which fed on the leaves. The injury may be of considerable importance in young plantations and nurseries. It is suggested that a sulphur spray should be effective against this pest.

WILLE (J.). **Gasförmige Bekämpfungsmittel gegen den Kaffeebeerenkäfer.** [Gas Insecticides against the Coffee Berry Borer.]—*Anz. Schädlingsk.*, i, no. 12, pp. 139–141. Berlin, 15th December 1925.

The author does not consider that dusting coffee bushes or the ground beneath them with calcium cyanide against the coffee berry borer, *Stephanoderes hampei*, Ferr. (*coffeae*, Hag.) in Brazil is likely to be of value, though fumigation of the harvested berries with hydrocyanic acid gas or chloropicrin should be more successful.

PRELL (H.). **Zur Geschichte der Forstschädlingsbekämpfung vom Flugzeuge aus.** [A Contribution to the History of the Use of Aircraft against Forest Pests.]—*Anz. Schädlingsk.*, i, no. 12, pp. 141–142. Berlin, 15th December 1925.

The history of the use of aircraft for the application of insecticides in the United States and in Germany is briefly described.

PAPE (H.). **Tomatenschädlinge.** [Tomato Pests.]—*Gartenwelt*, 1925, no. 36–37. (Abstract in *Anz. Schädlingsk.*, i, no. 12, pp. 142–143. Berlin, 15th December 1925.)

The pests of tomatos in Germany include the leaf-mining fly, *Liriomyza pusilla*, Mik, var. *fasciola*, Metg., which oviposits in May. Its larva occurs in June, the mine being marked by the dark line of excreta within. Pupation takes place in the ground, and a second generation appears in July and early August. As only a small part of the leaf-surface is destroyed, little damage is done by this pest. *Thrips flavus*, Schr., var. *obsoletus*, Uzel, may cause the leaves to shrivel up completely. Abundance of air, spraying with water, nicotine sulphate or tobacco-soap on dull days, or fumigation with nicotine or pyrethrum are the measures recommended. The potato flea-beetle, *Psylliodes affinis*, Payk., has been noticed on tomatos, though they have been hitherto thought to repel it. Spraying with nicotine or arsenicals or dusting with the latter should check it. Of the bugs, *Lygus pabulinus*, L., and *L. pratensis*, L., occur on the leaves. Spraying with paraffin-soap, quassia-soap, or lime-sulphur with the addition of 1 per cent. nicotine or 5 per cent. tobacco dust should be adopted.

HASE (A.). **Ueber Mottenbekämpfung mit " Mottenhexe."** [Combating the Clothes Moth with " Mottenhexe."]—*Zeitschr. Desinfektion u. Gesundheitswesen,* 1925, no. 8. (Abstract in *Anz. Schädlingsk.,* i, no. 12, p. 143. Berlin, 15th December 1925.)

As a result of tests conducted for 3 years in households, this proprietary compound is said to protect furs, etc., from clothes moths when kept in a confined space.

BRASSLER (K.). **Pelzkonservierung im Vakuum.** [The Storage of Furs in a Vacuum.]—*Anz. Schädlingsk.,* i, no. 12, pp. 143–144. Berlin, 15th December 1925.

The storage of furs in a chamber from which the air has been pumped out is said to protect them from insects, such as clothes moths.

[SPESĪVTZEV (P. N.).] SPESSIVTSEFF (P.). **Barkborrar-Scolytidae.**—*Svensk Insektfauna,* no. 28, pp. 143–194, 26 figs. Stockholm, Entomologiska Föreningen, 1925. Price *kr.* 1.75.

The Scolytid beetles of Sweden are described, with keys to the genera and species.

Deugdelijke middelen tegen plantenziekten en schadelijke dieren in den tuinbouw. [Effective Remedies against Diseases and Animal Pests in Horticulture.]—*Verslagen en Meded. Plantenziektenk. Dienst,* no. 43, 16 pp. Wageningen, December 1925.

This is a list of most of the insecticides of proved value against pests of orchards and garden plants, with brief notes in each case.

SCHELLENBERG (A.). **Durch Engerlinge verursachte Schädigungen in Neupflanzungen veredelter Reben.** [Injury by Cockchafer Larvae to New Plantations of Grafted Vines.]—*Schweiz. Zeitschr. Obst- u. Weinbau,* xxxiv, no. 26, pp. 450–454. Frauenfeld, 28th December 1925.

Considerable injury to new plantations of grafted vines by cockchafer larvae [*Melolontha*] has been observed in Switzerland. The beetles have a 3-year life-cycle, and it is in the second year that the attack is most severe ; some harm is also done in the third year, in which pupation begins. The vineyards attacked are those established on land that was meadow land in the first year or flight-year of the beetles. Vineyards made on land that was then under cultivation are not attacked because no eggs were laid there. The best measure is, therefore, to plough before the flight period (May) such meadow land as it is intended to plant with vines in the following year.

GRASSÉ (P. P.). **Cochylis et Eudémis.**—*Prog. agric. & vitic.,* lxxxv, no. 1, pp. 15–18, 1 pl. Montpellier, 3rd January 1926.

It is proposed to publish a series of articles, of which this is the first, based on a lengthy account of the vine moths [*Clysia ambiguella* Hb., and *Polychrosis botrana,* Schiff.] that has previously been noticed [*R.A.E.,* A, ix, 172], with the addition of more recently acquired facts regarding the morphology and biology of these pests, and the measures used for their control.

Mercet (R. G.). **Adiciones a la fauna española de Encírtidos (Hym. Chalc.) 5ª nota.** [Additions to the Spanish Encyrtid Fauna.]—*Eos*, i, no. 3, pp. 321–337, 3 figs. Madrid, 16th October 1925.

The new species here described include *Oencyrtus neustriae* from the eggs of *Dicranura vinula*, and *Protyndarichus coccidiphagus*, a parasite of a Coccid of the genus *Pulvinaria* or *Filippia*.

Wünn (H.). **In Elsass-Lothringen vorkommende Schildlausarten. (5. Mitteilung.).** [Coccids occurring in Alsace-Lorraine. (5th Communication.)]—*Zeitschr. wiss. Insektenbiol.*, xx, no. 9–10, pp. 239–248. Berlin, 10th December 1925.

This is a continuation of a list of which the preceding part has been noticed [*R.A.E.*, A, xiii, 394].

[Dobrzhanskiĭ (F. G.).] Dobzhansky (T.). **Ueber das Massenauftreten einiger Coccinelliden im Gebirge Turkestans.** [On the Mass Occurrence of some Coccinellids in the Mountains of Turkestan.]—*Zeitschr. wiss. Insektenbiol.*, xx, no. 9–10, pp. 249–256, 6 refs. Berlin, 10th December 1925.

The hibernation of Coccinellids in large numbers in the mountains of Turkestan is described [*cf. R.A.E.*, A, xi, 305].

Box (H. E.). **Sugar-cane Moth Borers (*Diatraea* spp.) in British Guiana.**—*Bull. Ent. Res.*, xvi, pt. 3, pp. 249–266, 21 refs. London, January 1926.

This is a continuation of work on the same problem by Cleare previously noticed [*R.A.E.*, A, xi, 113]. Both *Diatraea saccharalis*, F., and *D. canella*, Hmpsn., breed in a number of wild graminaceous plants, the most important being razor grass (*Paspalum virgatum*), which is abundant in the vicinity of cane fields. These are the only two species that are of economic importance as regards sugar-cane in British Guiana; *D. lineolata*, Dyar, occasionally attacks young canes, but chiefly feeds on wild native grasses.

The life-history as worked out in the laboratory has been confirmed by field observations. The eggs are laid in clusters of from 10 to 60 on the upper surface of the leaves. Those of *D. saccharalis* hatch in about 7 days, and those of *D. canella* about 36 hours later. The entire larval period, 3–5 weeks, is spent in feeding on the inner parenchymatous tissue of the growing cane-stalks. Pupation occurs in a widened larval burrow and occupies 8 days.

As a result of observations extending over three planting seasons not less than 20 per cent. of all seed cane planted has been found to contain living borers in various stages. In addition to the loss in germination due to the actual destruction of the buds, further damage is done by bacterial and fungous diseases that gain entry as a result of injury by these borers. The most important injury to mature sugar-canes is that done to the sugar-bearing tissue.

Existing methods of calculating the final infestation of cane-fields are discussed, that favoured being one in which the number of joints (internodes) in each stalk is counted, as well as the number showing visible borer injury, the proportion of the latter to the former giving the percentage of joint infestation. It is believed that infestation by these moths reaches a higher percentage in British Guiana than in any other country where sugar-cane is grown. The various factors influencing the prevalence of borers are discussed. These are mainly faulty methods of cultivation, which can be avoided to a large extent [*loc. cit.*]. The usual method of planting the "tops" at an angle of 20°, with the upper eye exposed, allows any borers present to complete their development and escape. Under normal conditions the "tops" will germinate as well if planted flat in a furrow and covered with a few inches of soil, which the moths cannot penetrate. In ratoon fields cutting the cane as near the ground as possible is the only means of reducing the infestation. The burning of fields prior to cutting is universal throughout the colony and is undoubtedly the chief reason for the high percentages of infestation that prevails throughout. By this means the egg-parasite, *Trichogramma minutum*, Riley, which would otherwise check the infestation at the very beginning, is practically exterminated. The variety of cane grown is of greater importance than the age of the field as regards the prevalence of the borers.

A list is given of the parasites occurring in British Guiana. Egg-parasites are the Chalcids, *T. minutum*, Riley, and *Prophanurus alecto*, Crawf., referred to as *Telenomus* sp. in early papers. Larval parasites are the Braconids, *Ipobracon grenadensis*, Ashm. (probably the *Iphiaulax medianus*, Cam., of all other writers on *Diatraea* in British Guiana); *Ipobracon puberulus*, Szep., apparently recorded for the first time; *I. saccharalis*, Turn.; four undetermied species of this genus; *Microdus diatraeae*, Turn.; *M.* (*Cremnops*) *parvifasciatus*, Cam.; and an undetermined species of this genus; an Ichneumonid, *Mesostenoideus* sp.; and a Dexiid fly. The pupae are attacked by the Chalcid, *Heptasmicra curvilineata*, Cam.

Predacious enemies are an ant, *Ectatomma quadridens*, F., the larvae of a Carabid, *Scarites* sp., and an Elaterid, *Monocrepidius* sp., the larvae and adults of the Histerid, *Lioderma quadridentatum*, F., the larvae of a Stratiomyiid fly, and spiders. The borers are also attacked by the fungus, *Cordyceps* (*Isaria*) *barberi*. Notes are given on the relative importance of these natural enemies in British Guiana, with a brief review of the author's observations on other species in Porto Rico [*R.A.E.*, A, xiii, 86].

CORBETT (G. H.). **Contribution towards our Knowledge of the Aleyrodidae of Ceylon.**—*Bull. Ent. Res.*, xvi, pt. 3, pp. 267–284, 20 figs. London, January 1926.

This list of the Aleurodids of Ceylon includes the following new species: *Aleurodicus antidesmae* on *Antidesma bunius*; *Dialeurodes* (*Rabdostigma*) *loranthi* on *Loranthus*; *D.* (*Rhachisphora*) *capitatis*, *D.* (*R.*) *setulosa*, *Aleurotrachelus longispinus*, *Aleurolobus zeylanicus* and *A. greeni* on undetermined plants; *Aleuroplatus ficus-gibbosae* on *Ficus gibbosa*; *A.* (*Orchamus*) *premnae* on *Premna cordifolia*; *Bemisia emiliae* on *Emilia sonchifolia*; *Aleurodes hyperici* on *Hypericum* sp.; *Aleurocanthus obovalis*, *A. niger*, *A. nigricans* and *Laingiella* (gen. n.) *bambusae* on bamboo; *Neomaskellia andropogonis* on *Andropogon* sp.; *Tetraleurodes rugosus* on grass; *T. semilunaris* on citronella grass (*Cymbopogon* sp.); and *Zaphanera* (gen. n.) *cyanotis* on *Cyanotis* sp.

KARNY (H. H.). **On some Tropical Copeognatha, especially from the Fiji Islands.**—*Bull. Ent. Res.*, xvi, pt. 3, pp. 285–290, 5 figs. London, January 1926.

The species dealt with include *Pseudocaecilius marshalli*, sp. n., from Fiji on young cotton.

A key is given to the Indo-Australian species of *Epipsocus*.

SIMMONDS (H. W.). **Pests and Diseases of the Coconut Palm in the Islands of the Southern Pacific.**—*Fiji Dept. Agric.*, Bull. 16, 31 pp., 4 pls. Suva, 1925.

Many of the pests here dealt with have already been recorded [*R.A.E.*, A, xii, 298] and are omitted from this abstract. Of Coleoptera attacking the trunks of coconut palms only the weevils, *Diocalandra taitensis*, Guér., and *Rhabdocnemis* (*Sphenophorus*) *obscura*, Boisd., are known to infest healthy trees in Fiji. In the adjoining groups of Islands other species may cause considerable damage either as adults or in the larval stage, and *Oryctes rhinoceros*, L., has become a serious pest in Samoa.

Pests of the foliage are the Hispid, *Promecotheca reichei*, Baly, which occurs in the Fiji, Wallis and Fortuna Islands, and is parasitised by the Chalcid, *Chaetostricha cratitia*, Watrst. ; *Corone palmarum*, Moore, found in New Britain and elsewhere, the larvae being parasitised by a Chalcid, *Chalcis solomonis*, Cam., and an Ichneumonid, *Echthromorpha pallidilineata*, Cam. ; *Agonoxena argaula*, Meyr., the attacks of which are frequently mistaken for those of *Levuana iridescens*, B.B., in Fiji ; *A. pyrogramma*, Meyr., occurring in the Solomons, Bismarcks and New Guinea ; and *Cryptoblabes* sp., nr. *plagioleuca*, Turn., causing considerable damage in Tahiti. Other Lepidoptera of less importance are *Hectacma indicatrix*, Meyr., and *Decadarchis euophthalma*, Meyr., both from Samoa, and *D. psammaula*, Meyr., from the Society Islands. The Locustid, *Habetia defoliaria*, Uv., has completely defoliated coconuts in New Britain, and the Phasmid, *Graeffea coccophaga*, Newp., is destructive in the Fiji, Wallis, Fortuna and adjacent Groups.

A number of Coccids are reported from coconut, the most important being *Aspidiotus destructor*, Sign., found in the Society Islands, New Britain, parts of the Solomons, and Fiji, and against which *Aspidiotiphagus citrinus*, Craw, and *Aphelinus chrysomphali*, Merc., have been successfully introduced into Fiji from the Society Islands. *Pinnaspis* (*Hemichionaspis*) *minor*, Mask., is abundant in Fiji, but does little damage. *Pseudococcus vitiensis*, Green & Laing, which is preyed on by *Neda tricolor* var. *fijiensis*, Crotch, *Aspidiotus simmondsi*, Green & Laing, *A. pangoensis*, Doane & Ferris, *A. palmae*, Ckll., *Chrysomphalus dictyospermi*, Morg., *Pseudococcus cocotis*, Mask., and *Pinnaspis buxi*, Bch., are recorded from Fiji.

Tetranychus fijiensis, Hirst, originally discovered on seedling coconuts at Ovalau, has now spread to another island of the Fijian group, where it has been found on older palms.

The moth, *Acritocera negligens*, Butl., is so far only found in Fiji, where it does considerable damage by boring up through the flower buds in the unopened spathes. In Fiji no insects are known to attack the flowers of the coconut, but from the New Hebrides to New Guinea, a Pentatomid, *Axiagastus cambelli*, Dist., occurs in large numbers, as well as several Cetoniids ; the latter feed on the pollen and probably assist in pollination, whereas *A. cambelli* does harm by wounding the plant and allowing the entrance of fungus spores.

The nuts are attacked by the fly, *Scholastes bimaculatus*, Hend., which is replaced in the Cook Islands by *S. lonchifera*, Hend. A form of bud rot that occurs in Fiji is possibly due to the presence of Nematodes.

The ant, *Oecophylla smaragdina*, Latr., occurs intermittently from Australia through the Solomon Islands and New Guinea to Southern China and in various forms as far as West Africa. Though it is looked upon as a nuisance in Java and Malaya owing to its bites, in various islands of the southern Pacific its value as a destroyer of insect pests is considered of sufficient importance to warrant its protection.

A table is given showing the insect pests dealt with arranged under their orders and indicating the country of origin, portion of tree attacked, and natural enemies.

[PUKHOV (B. A.).] **Пухов (Б. А.). Injurious Locusts and their Control.** [*In Russian.*]—8vo, 69 pp., 15 figs. Leningrad, " Muisl'," 1925. Price, *kop*. 50.

This is a popular handbook on locusts and grasshoppers and their control by the usual methods.

[ÉNGEL'HARDT (V. M.).] **Энгельгардт (В. М.).** *Prumna primnoa*, **Fisch.-Wald., as a Pest of Agriculture in the Far East.** [*In Russian.*]—*Défense des Plantes*, ii, no. 6, pp. 298–300. Leningrad, November 1925.

Prumna primnoa, F.-W., is apparently recorded for the first time as a serious pest. Even in Ussuri, where it has been known to occur for at least 20 years, it has never been observed to cause any serious damage. During 1925, however, various crops, including cucurbits, but particularly potatoes, young oats, barley and wheat, were attacked. The area infested amounted to over 300 acres, and the damage varied from 15 to 50 per cent. of the crops. This locust always occurs in greatest abundance on the edge of forests, and in attacking crops it never penetrates to the centre of the fields unless the latter are in narrow strips. Poison baits as applied against other locusts proved effective, but the proportion of sodium arsenite had to be raised to 1 lb. to 20 of the bait (bran). Owing to the weather conditions, the baits dried in about half an hour, after which they were no longer attractive.

[STARK (V. N.).] **Старк (В. Н.).** *Hylobius piceus*, **DeG.** (*pineti*, **F.**), **on Conifer Undergrowth in Forests of the Bryansk Government.** [*In Russian.*]—*Défense des Plantes*, ii, no. 6, pp. 300–301. Leningrad, November 1925.

Hylobius piceus, DeG., occurred in great abundance in Bryansk during 1922 among seedling conifers. During the subsequent years (1923–1925) the numbers of the beetles considerably decreased, but the effect on the young trees remained, those that had survived being retarded in growth. The larvae usually occur in weak trees. The eggs are laid at the junction of the trunk and roots and in the upper roots. The trees selected for oviposition were never killed, but were considerably weakened and were attacked in the following year by various bark-beetles, including *Myelophilus minor*, Hart., *M. piniperda*, L., *Ips proximus*, Eich., and *I. laricis*, L. The egg-laying period lasted from the middle of June to the middle of September, the first larvae were found in the stumps on 8th August and in the trees four days later. A large number of the eggs were destroyed in the standing trees by the exudation of resin, so that only isolated larvae could be found. In the stumps the larvae were commonly destroyed by the predacious Histerid, *Cylistosoma* (*Platysoma*) *oblongum*, F., and by the beginning of October only very few larvae remained.

[Mal'tzev (M. V.).] **Мальцев (М. В.). On the Number of Egg-masses laid by different Species of Grasshoppers.** [*In Russian.*]—*Défense des Plantes*, ii, no. 6, pp. 301–306. Leningrad, November 1925.

This is a summary of the results of laboratory experiments on the oviposition of various grasshoppers. Females of *Gomphocerus sibiricus*, L., laid 7–18 egg-masses each, *Arcyptera microptera*, F.-W., up to 4, *Dociostaurus crucigerus brevicollis*, Ev., not more than 1, *Chorthippus albomarginatus*, DeG., 2–22, and *Chrysochraon brachypterus*, Ocsk., 4–16. It was found by dissection that females die while large numbers of eggs still remain in their ovaries.

[Shchegolev (V. N.).] **Щеголев (В. Н.). The Influence of Soil Conditions on the Infestation of Fields by the Larvae of** *Euxoa segetum*, **Schiff., and** *Feltia exclamationis*, **L.** [*In Russian.*]—*Défense des Plantes*, ii, no. 6, pp. 306–309, 4 refs. Leningrad, November 1925.

During an extensive outbreak of *Euxoa segetum*, Schiff., and *Feltia exclamationis*, L., in the Cherepovetz Government, observations made on the former showed that, apart from other conditions, those of the soil are important factors in determining its relative abundance. Its presence in the field is mainly influenced by the physical conditions of the soil, that most easily penetrated by the larvae being the most heavily infested. Thus the author does not consider that the increased infestation recorded by Plīgīnskiĭ [*R.A.E.*, A, xiii, 473] is due so much to the presence of convolvulus as to the extreme looseness of the soil as a result of clean cultivation. Fallow will only save the future crop if it is kept clean, and all weeds should be destroyed at as short intervals as possible during the flight period of the moths.

[Lebedeva (E. A.).] **Лебедева (Е. А.). Contribution to the Identification of the Larval Stages of Locusts.** [*In Russian.*]—*Défense des Plantes*, ii, no. 6, pp. 309–311. Leningrad, November 1925.

A reliable method of identifying the stages of the larvae of locusts is usually considered to be afforded by the number of antennal joints, which increases with each moult. The author finds that this character is not constant in the case of *Locusta migratoria*, and she considers that the length of the hind femur is a much more reliable and suitable character for separating the stages.

[Masaĭtis (A. Ī.).] **Масайтис (А. И.). A Note on the Biology of** *Barathra* (*Mamestra*) *brassicae*, **L.** [*In Russian.*]—*Défense des Plantes*, ii, no. 6, pp. 311–312 & 321. Leningrad, November 1925.

This note deals with the length of life of the adults of *Barathra brassicae*, L., as observed during 1923 in Northern Russia, where it is a very common pest of cabbages. The pairing and fertility of this Noctuid and the number of larval moults are also discussed. Under experimental conditions, when fed on syrup, individual moths may live as long as 24 days and lay over 2,000 eggs.

[Petrova (V. P.).] **Петрова (В. П.). The Biology of the Strawberry Beetle,** *Galerucella tenella*, **L.** [*In Russian.*]—*Défense des Plantes*, ii, no. 6, pp. 321–330, 3 figs. Leningrad, November 1925.

The Chrysomelid, *Galerucella tenella*, L., is a serious pest of strawberries in Astrakhan [*R.A.E.*, A, ii, 36], but in northern Russia (Peterhof), where these observations were made, it does not occur in sufficient numbers to be of any great economic importance. The various stages are described, and the life-history and habits as observed in greenhouses and under conditions approximating as nearly as possible to those occurring in nature are discussed. The beetles feed on the leaves, the injury being done both by the adults and the larvae, but chiefly by the latter. Oviposition occurred from the end of May to the end of July, all the stages appearing to be prolonged in the more northern latitude. Under almost natural conditions at an average temperature of 14·6° R. [64·8° F.] the eggs hatched in 21–23 days, whereas under greenhouse conditions with a temperature of 18·7° R. [73·8° F.] they only required 13–16 days; the larval stage lasts 30–34 as compared with 23–27 days, and the pupal stage 9–10 as compared with 8–9 days.

The author approves of the spraying recommended by Sakharov [*loc. cit.*] but does not attach any special value to the destruction of weeds, as this beetle is not found on them, except that by digging many pupae are directly destroyed and others exposed on the surface, where they soon succumb. Strawberries should be planted on as dry land as possible, the beetles preferring humid soil.

[Megalov (A.).] **Мегалов (А.). Report of the Saratov Station for the Protection of Plants.** [*In Russian.*]—*Défense des Plantes*, ii, no. 6, pp. 361–370. Leningrad, November 1925.

This is a summary of work carried out during 1924. Measures against locusts included the use of poison baits, sprays and mechanical measures, the latter being largely applied before other materials could be obtained. *Calliptamus* (*Caloptenus*) *italicus*, L., was the most prevalent species, others being *Oedaleus decorus*, Germ. (*Pachytylus nigrofasciatus*, DeG.), *Oedipoda coerulescens*, L., and *Podisma* (*Pezotettix*) *pedestris*, L.

A list of the insect pests recorded during the year is given, with brief notes on their incidence. They include *Anisoplia austriaca*, Hbst., causing considerable injury throughout the southern portion of Saratov; *Mylabris quadripunctata*, L., occurring everywhere in large numbers on rye; *Epicauta erythrocephala*, Pall., a serious pest of potatoes in some districts; *Cetonia aurata*, L., causing considerable and widespread injury to fruit blossoms; *Rhynchites auratus*, Scop., damaging up to 80 per cent. of the fruit; *Eurydema ornatum*, L., causing considerable injury to various crucifers, especially cabbage; and *Gryllotalpa gryllotalpa*, L. (*vulgaris*, L.), destroying large numbers of young seedling cabbages.

[Olenev (N. O.).] **Оленев (Н. О.). Notes on the Morphology and Biology of** *Apanteles glomeratus*, **Reinh.** [*In Russian.*]—*Défense des Plantes*, ii, no. 6, pp. 377–378. Leningrad, November 1925.

The pairing and oviposition of *Apanteles glomeratus*, L., parasitic on the cabbage butterfly [*Pieris brassicae*, L.], as observed in Northern Russia, are described. In the spring the eggs hatch in 5–6 days, and in the autumn in 10–12. The larvae emerge from their host 23–32 days after the eggs have been laid, and pupate about 3 days later. The adults appear in 13–17 days.

[Vorontzovskiĭ (P. A.).] **Воронцовский (П. А.). On the Biology of** *Sarcophaga lineata*, **Fall.** [*In Russian.*]—2 pp. Orenburg, 1925. (Abstract in *Défense des Plantes*, ii, no. 6, p. 379. Leningrad, November 1925.)

Sarcophaga lineata, Fall., is recorded for the first time as a parasite of *Celes variabilis*, Pall., and *Oedaleus decorus*, Germ. The larvae emerged from the back of the head of the locusts. Individuals of *O. decorus* were frequently found with the emergence hole in the head.

[Dryenovskī (A. K.).] **Дрѣновски (А. К.). An Outbreak of Locusts in Sofia in 1919.** [*In Bulgarian.*]—Spīsanīe na Zemledyelskītye Īzpītatelnī Īnstītutī v B'lgarīya, iii, no. 2–3, pp. 251–262. Sofia, 1925. (Abstract in *Défense des Plantes*, ii, no. 6, pp. 379–380. Leningrad, November 1925.)

Various species of Acrididae caused serious losses to crops in the Sofia district in 1919. The most numerous and injurious species was *Calliptamus italicus*, L. (52·6 per cent. of the whole number), next in importance being *Dociostaurus crucigerus brevicollis*, Ev. (19 per cent.), *D. maroccanus*, Thunb. (1·2 per cent.), and *Locusta migratoria* ph. *danica*, L. (0·4 per cent.). Some damage was also done by *Tettigonia viridissima*, L., *Decticus verrucivorus*, L., and *D. albifrons*, F. Parasitism was very high amongst adult grasshoppers.

[Nazarov (P. S.).] **Назаров (П. С.). Control of** *Tetranychus telarius* **in Armenia in 1925.** [*In Russian.*]—Khlopkovoe Delo [*Cotton Industry*], iv, no. 11–12, pp. 1072–1074. Moscow, November-December 1925.

During 1925 *Tetranychus telarius*, L., was particularly abundant in the cotton fields of Armenia. Dusting with sulphur (15 lb. per acre), though effective against the other stages, does not kill the eggs. Further disadvantages of this treatment are its high cost and the injury caused to melon and similar plants in the vicinity of dusted cotton. There is urgent need for field tests with other possible materials, such as flour paste, kerosene emulsion, etc.

[Shcherbakov (Th. S.).] **Щербаков (Θ. С.). Part 1. Clover Weevils**—*Apion*, **their Biology and Economic Importance. Part 3. Spring Mowing of Seed Red Clover.** [*In Russian.*]—Trudui Shatīlovskoĭ S.-Kh. Opuitnoĭ Stantzīī [*Trans. Shatilov Agric. Expt. Sta.*], Ser. vi, Ent. Div., nos. 2 & 3, 233 & 60 pp., 4 pls., 51 & 21 refs. Orel, 1922. [Recd. February 1926.]

These two papers are part of a monograph dealing with the cultivation of seed red clover in Russia. Part 2 of the same work deals with *Bruchophagus gibbus*, Boh., and has already been noticed [*R.A.E.*, A, x, 116]. The information concerning the clover weevils, *Apion aestivum*, Germ., and *A. apricans*, Herbst, and the effect of spring mowing on the crop has largely been noticed from various shorter articles by the author [*R.A.E.*, A, iv, 142; v, 30; vi, 65; etc.].

Minkiewicz (S.). **Studja nad miodówka jabloniowa** (*Psylla mali* **Schmidberger**). **Część 1. Morfologja i ubarwienie.** [*Psylla mali*, Schmid. Part 1. Morphology and Colouring.]—*Mém. Inst. Nat. polon. Econ. rur. à Pulawy*, v, pt. A, pp. 250–272, 2 pls., 18 refs. Krakow, 1924. (With a Summary in English.) [Recd. January 1926.]

The information contained in this paper has already been noticed from another source [*R.A.E.*, A, xiii, 215].

Novák (S.). **Bzunka, nebezpečný škůdce ozimů a jařin.** [The Frit-fly, a serious Pest of Winter and Summer Crops.]—*Ochrana Rostlin*, v, no. 6, pp. 92–94. Prague, December 1925.

An account is given of *Oscinella* (*Oscinis*) *frit* and *O.* (*O.*) *pusilla* attacking cereals. The usual remedial measures are also briefly reviewed.

Rozsypal (J.). **Odumírání listů chrysanthem následkem napadení hád'átky rodu** *Aphelenchus ritzema-bosi* **Schvartz.** [The Dying-off of Chrysanthemum Leaves as a Result of the Attack of *A. ritzemabosi*, Schwartz.]—*Ochrana Rostlin*, v, no. 6, pp. 94–96, 2 figs. Prague, December 1925.

Aphelenchus ritzemabosi, Schwartz, is a pest of *Chrysanthemum* in various parts of the world, and has occurred in injurious numbers on all varieties of these plants during the past year in Moravia. The leaves of attacked plants contain hundreds of individuals, and become withered. The importance of sterilising the soil to be used in forcing beds, etc., is pointed out, and various methods of doing this are reviewed.

Heikertinger (F.). **Allgemeines über Züchtung von Insekten.** [General Notes on the Rearing of Insects.] *in* Aberhalden (E.), **Handb. biol. Arbeitsmethoden,** pp. 25–80, 16 figs., numerous refs. Berlin & Vienna, Urban & Schwarzenberg [1925?].

Various methods for rearing insects in the open and in the laboratory are described.

AUE (A. U. E.). **Der Schwammspinner.** [The Gipsy Moth.]—*Ent. Zs.*, xxxix, nos. 36–39, pp. 145–146, 149–150, 153–154, 158–159. Frankfort-on-Main, December 1925–January 1926.

All the known variations of *Porthetria* (*Lymantria*) *dispar*, L., are described, with particulars of the life-history of the moth.

FIELITZ (H.). **Untersuchungen über die Pathogenität einiger im Bienenstock vorkommenden Schimmelpilze bei Bienen.** [Researches on the Pathogenicity to Bees of some Moulds found in Bee Hives.]—*Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxvi, pp. 28–50, 6 figs., 59 refs. Jena, 31st December 1925.

Two fungi, *Pericystis apis* and *Aspergillus flavus*, that are found in bee-hives are known to be pathogenic to the honey bee. *Trichoderma lignorum* can also infect bees, though the infection is not epidemic in character.

SCHAFFNIT (E.) & BÖNING (K.). **Die Erdschnaken.** [Tipulids.]—*Dtsch. landw. Presse*, 1924, no. 29, reprint, 7 pp. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxvi, p. 125. Jena, 31st December 1925.)

In the spring of 1924 great injury was done by Tipulid larvae to clover, cereals, rape, beans, potatoes, etc., in the Rhine province, Westphalia and Oldenburg. The species concerned were *Pachyrrhina maculata*, *P. maculosa*, *P. pratensis* and *Tipula oleracea*. The young larvae are very sensitive to dryness, and outbreaks usually occur after a wet spring has followed a wet autumn and wet late summer. The measures advised are those now generally advocated. Insectivorous birds exercise a considerable check and they should be encouraged.

WORTMANN (J.). **Ueber das Auftreten und den Gang der Reblausverseuchungen in den preussischen Weinbaugebieten.** [The Occurrence and Course of *Phylloxera* Infestations in the Prussian Vine-growing Districts.]—*Veröffentlich. d. Preuss. Hauptlandwirtschaftskamm.*, H.5. Berlin, Paul Parey, 1924. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxvi, p. 142. Jena, 31st December 1925.)

In this account of the occurrence and spread of *Phylloxera* in the vine-growing areas of Prussia the author considers that carriage by the wind is the chief factor in the dissemination of the Aphid.

BLUNCK (H.) & JANISCH (R.). **Die Rübenaaskäfer und ihre Bekämpfung.** [Silphid Beetles of Beet and their Control.]—*Mitt. dtsch. Landw.-Ges.*, St. 24, 1925. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxvi, pp. 149–150. Jena, 31st December 1925.)

The contents of this paper on *Blitophaga opaca*, L., are substantially the same as those of one already noticed [*R.A.E.*, A, xiii, 395].

Blunck (H.). **Der Stand der Rübenfliegenfrage.** [The Position of the Beet-fly Question.]—*Mitt. dtsch. Landw.-Ges.*, St. 25, 1925. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxvi, p. 150. Jena, 31st December 1925.)

Early in 1924 a station was established in Pomerania for investigations on the beet-fly, *Pegomyia hyoscyami*, Panz. The climatic conditions prevent parasites from exercising the same control that they do in southern Europe, and other factors may also account for its increase. Kleine suggests that the spread of weeds, such as Chenopodiaceae, is connected with the increased injury [*R.A.E.*, A, ix, 39; xi, 167]; but the author believes that their importance as food-plants has been overestimated, for *Chenopodium album*, which has been more especially suspected, has been rejected by the fly even in the absence of beet. There may be biological races of *P. hyoscyami* with a restricted range of food-plants. Instead of the late sowing, advised by Kleine, the author suggests early sowing so that the plants may not be attacked when yet tender seedlings. Tests are being made to ascertain what remedial measures are effective. As the larvae do not die in plants that have been uprooted, the destruction of such plants must be of some value.

Kleine (R.). **Ueber die Abhängigheit des Auftretens von** *Oscinis frit* **von der Temperatur.** [On the Dependence of *Oscinella frit* on Temperature.]—*Fortschritte Landw.*, i, no. 1, pp. 9–11, 10 refs. Vienna, 1st January 1926.

The author's observations on the dependence of insects on temperature and on the correlation between it and the appearance of a given species have already been discussed [*R.A.E.*, A, xi, 167; xii, 71, 293]. Two series of observations, one at Stettin and the other at Warsow about 3 miles away, were made in 1925 to determine the influence of temperature on the frit-fly, *Oscinella* (*Oscinis*) *frit*, on oats. The temperatures were taken at a depth of about 3 feet below the surface of the ground. The unit used was 1°C., and the total number of degrees over the period of observation was taken as governing development. This total at Warsow between 1st January and 15th April was 382·5°, and the first sowing of oats showed no trace of infestation by *O. frit*. The corresponding figure at Stettin was 477·5°. Here infestation occurred, though some varieties of oats escaped attack. Of 48 varieties sown 5 retained their resistance right up to the harvest. A general infestation, therefore, does not occur at a total of 477·5°, though it may be advisable to begin using a sweeping net when a total of 450 is reached, as this will afford an indication of the way in which the infestation is developing.

Braun (K.). **Der Apfelsauger im Obstbaugebiet der Unterelbe** (*Psylla mali*). [The Apple-sucker, *P. mali*, in the Fruit Districts of the Lower Elbe.]—*Die Landwirtschaft*, no. 1 (1926); *Stader Tageblatt*, Suppmt., 26 pp., 43 refs. Stade, 1926.

Psylla mali has done considerable harm in the fruit-growing districts on the Elbe below Hamburg, and is held to be responsible for the decreased apple crops. A popular account is given of its habits. As the various methods usually employed against it, such as smoke clouds of tobacco, clay washes, Theobald's mixture, etc., have proved unsatisfactory, arrangements are being made to apply lime-sulphur with motor sprayers during the present winter and coming spring, when it is hoped to check the infestation, which is due largely to neglect during and after the war.

MacDougall (R. S.). **The Apple Fruit Moth or "Miner"** (*Argyresthia conjugella*, **Zeller**).—*Scottish Jl. Agric.*, ix, no. 1, reprint, 7 pp., 9 figs., 7 refs. Edinburgh, January 1926.

Apples in northern and eastern Scotland were severely damaged by the larvae of *Argyresthia conjugella*, Zell. (apple fruit moth) in 1925, and damage was also reported from northern Ireland. The moths begin to appear in June and July, and the eggs are laid within about a week after emergence. It is thought that the eggs are usually laid on the young fruit, which the larvae enter at any point, and in which they make irregular tunnels to the core, where they feed on the pips; sometimes the larvae mine just beneath the skin of the apple. A number of larvae may be found in a single apple. Eventually they generally mine to the surface of the apples and descend to the ground by a silken thread or by way of the trunk of the tree, or the apples may fall before the larvae leave them. In these cases the larvae spin their double silken cocoons in the earth or among dead leaves on the ground. Sometimes, however, they do not leave the apples, but spin their cocoons in the fallen fruit, either in the core or in a gallery a little way back from a previously prepared exit-hole. This occurred frequently in breeding-cages, and the mortality from the development of mould with the rotting of the fruit was then high. It is probable also that many of those insects that pupate in the middle of the apples are unable to emerge on reaching the adult stage. The larvae from eggs laid early in the season become full-grown and make their cocoons in about a month, but those from eggs laid later feed for considerably longer periods, some being still feeding in September and October.

In Scotland all varieties of apple were attacked, but in Ireland one variety, Bramley's Seedling, appeared to be immune.

The natural food of *A. conjugella* in Scotland is the fruit of the mountain ash (*Sorbus aucuparia*), and the author considers that the infestation of apple in 1925 was due to the almost entire absence of berries on this tree, after several years in which they were plentiful, and in which the increase of the moth was consequently favoured [*cf. R.A.E.*, A, vi, 150]. In view of this fact it would be advisable to spray apple trees with lead arsenate about the time of oviposition of the moths in any year in which the mountain ash berries are scarce, the object being to kill the young larvae as they begin to penetrate into the fruit. A second spraying might be necessary owing to the extended flight period of the moths. Where apples have been infested, the ground underneath the trees should be dug and then made firm to destroy the hibernating larvae in the cocoons; fallen apples should be collected and destroyed.

As *A. conjugella* is a new pest of apple in Scotland and consequently little known, parallel descriptions of its larva and the damage caused by it, and of the larvae and damage caused by *Cydia pomonella*, L. (codling moth), and *Hoplocampa testudinea*, Klug (apple sawfly), are given. A brief description is also given of *Rhagoletis pomonella*, Walsh (apple maggot), and the nature of its damage; this is one of the pests scheduled by the Ministry of Agriculture [England] and the Board of Agriculture for Scotland, the presence of which must be immediately reported.

LIGHT (S. S.). **The Fauna and Flora of Apple Bark.**—*Ann. & Mag. Nat. Hist.*, xvii, no. 97, pp. 126–149, 14 refs. London, January 1926.

The primary object of this paper is to gain an idea of the variety of insect and other life that might be injurious to the apple tree. In the case of insects, particular attention has been paid to the stages in which they occur under the bark and the manner in which they hibernate. The collections were made in the Bristol district, some 90 species being recorded, including the following of economic importance : *Anthonomus pomorum*, L. (apple blossom weevil) ; *Xyleborus dispar*, F. (shot-borer beetle) ; *X. xylographus*, Say (flat-celled shot-borer) ; *Eriosoma lanigerum*, Hausm. (woolly aphis) ; *Aspidiotus ostreaeformis*, Curt. (oyster-scale) ; *Lepidosaphes ulmi*, L. (mussel scale); *Notolophus* (*Orgyia*) *antiquus*, L. (vapourer moth) ; *Arctornis chrysorrhoea*, L. (*Porthesia similis*, Fuess.) (gold-tail moth) ; *Cheimatobia* (*Operophthera*) *brumata*, L. (winter moth) ; and *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth).

STRACHAN (J.) & TAYLOR (T. H.). **Potato Eelworm.**—*Jl. Minist. Agric.*, xxxii, no. 10, pp. 941–947, 1 ref. London, January 1926.

An eelworm similar to, if not identical with, *Heterodera schachtii*, Schmidt, occurs in potatoes in many parts of England, and although it does not always appear to affect the yield, in some places it causes serious loss, a badly infested crop being sometimes almost a complete failure. The attack is generally confined to the roots, but may spread to the tubers. The life-history of the Nematode is briefly described ; it does not seem to spread at all rapidly in the soil, and it is probable that cultivating implements are chiefly responsible for its diffusion through a field and from one field to another. Rotation of crops has given good results in increasing the yield of potatoes, but potatoes should not be grown for two years in succession on land that has once been infested, even after an interval under other crops. It is possible that lifting potatoes earlier in the season than is usual may tend to reduce the eelworm infestation in the following year. No difference in degree of infestation was noticed between fields grown from seed potatoes obtained from places where the eelworm does not occur and those in which seed from infested fields was used. Manuring with sulphate of potash considerably increased the yield on potato plots infested with eelworm, but cannot be regarded as an efficient control measure. Care should be taken that soil from infested areas is not introduced into non-infested ones, and soil from infested potatoes should be removed and disposed of carefully, as it may contain encysted eelworms. If infested potatoes are used as food for pigs they should be boiled first, as it is not known whether the encysted eelworms can pass through the animals and survive in the dung until it is distributed as manure. When a potato crop is cleared from a field, stray tubers should not be allowed to remain, as they will harbour the Nematodes during the time that the ground is occupied by other crops.

STENTON (R.). **The Control of Aphides infesting Bulbs in Store.**—*Jl. Minist. Agric.*, xxxii, no. 11, pp. 1037–1041. London, February 1926.

Anuraphis tulipae, Boy., causes considerable injury to various bulbs and rhizomes in storage, and though the initial stages may not be detected without destroying the bulbs, consignments exported overseas may have to be destroyed on arrival at their destination. *Rhopalosiphoninus tulipaella*, Theo., has also been recorded on stored bulbs. As a result of experiments, which are still in progress, paradichlorobenzene has proved to be an effective remedy both against the Aphids and against mites, and it may possibly also kill the larvae of the narcissus fly [*Merodon equestris*, F.]. The most satisfactory method for using paradichlorobenzene crystals is to place a layer of them in the bottom of a box used as a fumigation chamber, cover them with a single thickness of sacking of somewhat loose texture, place a single layer of bulbs upon this, cover them with another piece of sacking, and finally place upon this a second layer of crystals. The bulbs are then shut down for at least 48 hours, preferably 3 days. It is possible that the time of exposure might be reduced if the treatment was resorted to at an early date after the lifting of the bulbs. It is essential that the box should be as air-tight as possible and as full as possible. The bulbs may be arranged in layers alternately with the paradichlorobenzene. For a single layer of bulbs 4 oz. of paradichlorobenzene was used per square foot placed between fairly loose sacking. When the bulbs are placed in successive layers, this only applies to the bottom layer of bulbs, which has 2 oz. per sq. ft. above and below it; each succeeding layer would require only 2 oz. per sq. ft.

The paradichlorobenzene may also be dissolved in carbon tetrachloride at the rate of 1½ oz. to 6 oz. A cloth is dipped in the solution until thoroughly soaked and then hung in the open air until all the carbon tetrachloride has evaporated. An ordinary glass cloth covering 4 sq. ft. will take about two-thirds of the solution of the above proportions. The carbon tetrachloride evaporates in a few minutes. When dry, the cloth is laid between the layer of bulbs instead of the crystals between the sacking. By this method less paradichlorobenzene is used, and all Aphids and mites are killed after 48 hours.

MURPHY (P. A.) & M'KAY (R.). **Methods for investigating the Virus Diseases of the Potato, and Some Results obtained by their Use.**—*Sci. Proc. R. Dublin Soc.*, N.S., xviii, no. 14, pp. 169–184, 2 pls., 16 refs. Dublin, 15th January 1926.

A method of grafting a core from a potato tuber into another tuber, for the transmission of virus diseases, is described; by this means diseases of the mosaic type were transmitted satisfactorily; leaf-roll was, however, transmitted only rarely. Aphid transmission of leaf-roll is not a sufficiently reliable method for routine work, although three species have been proved capable of transmitting this disease [*R.A.E.*, A, xiii, 589]. The Capsid, *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.) was again found to transmit leaf-roll [*R.A.E.*, A, xi, 392]. The authors' experiments with insects as vectors of virus diseases show that negative results with any particular insect cannot be considered as proof that the insect is not a vector. To test the possibility of the transmission of virus from female Aphids to their progeny, a number of mature parthenogenetic females were removed from the sprouts of diseased potato tubers to a glass vessel, where they produced larvae. These were transferred to healthy tubers, on which they fed for several weeks ; the results of these experiments were negative. A method is described by which the rate of spread of a virus in the potato plant can be studied. Leaf-roll virus, introduced by scions grafted on to the tops of stems, reached all parts of stems and tubers in 8–15 days.

PAILLOT (A.). **Sur un Vibrion parasite des chenilles de *Pieris brassicae* L.**—*C. R. Soc. Biol.*, xciv, no. 1, pp. 67–69, 1 ref. Paris, 15th January 1926.

Vibrio pieris, sp. n., has been isolated from larvae of *Pieris brassicae*, L., which had been parasitised by *Apanteles glomeratus*, L. Though it may be found in large numbers in the blood of the larvae, it never causes their death, and if it is injected into larvae that are not parasitised, the infection never becomes general. The micro-organism is probably transmitted by *A. glomeratus* [*cf. R.A.E.*, A, xi, 549].

PIÉDALLU (A.). **Destruction de parasites dans les approvisionnements de céréales.**—*Jl. Agric. prat.*, xlv, no. 6, pp. 113–117, 2 figs. Paris, 6th February 1926.

Experiments for the destruction of insect and other pests of stored products carried out on a large scale in the course of 1921–25 are briefly reviewed. The best results were obtained with chloropicrin, 220 lb. of this fumigant being used in stores of 309,000 cu. ft. capacity and containing 2,700 metric tons of wheat. The grain proved to be normal in every way after fumigation.

(N.). **Resultats des essais de lutte contre le ver de la vigne effectués en 1925 dans la vigne du Séminaire à la Combettaz.**—*Progrès agric. & vitic.*, lxxxv, no. 3, pp. 64–65. Montpellier, 17th January 1926.

A table is given showing the amount of wine obtained from 8 different plots in a vineyard at Combettaz, each of which received different treatments against vine moths [*Polychrosis botrana*, Schiff.]. The highest return was obtained from a plot receiving two applications of lead arsenate in a copper sulphate spray on 3rd and 9th June, against the first generation, powdered lime and calcium carbide on 7th and 11th July against the second generation, and the same on 29th July and 9th August against the third generation.

FEYTAUD (J.). **Existe-t-il plusieurs races de *Reticulitermes lucifugus* Rossi ?**—*Rev. Zool. agric. & app.*, xxiv, no. 8, pp. 161–169, 4 figs., 11 refs. Bordeaux, August 1925. [Recd. February 1926.]

The existence of different races of various insects is discussed, and the possibility of similar differences existing in the case of *Reticulitermes lucifugus*, Rossi, is indicated by the difference in the habits and reproduction of this termite in France and Italy. The species of *Reticulitermes* that occur in France are *R. lucifugus* and *R. flavipes*, Kollar.

DELASSUS (—). **Sur un nouveau procédé de lutte contre la teigne de la pomme de terre** (*Phthorimaea operculella*).—*C. R. Acad. Agric. France,* xii, no. 1, pp. 38–39. Paris, 1926.

In Algeria, where potatoes are kept for an indefinite time in storehouses that are not properly sealed, they are often seriously damaged by the attacks of *Phthorimaea operculella* (potato tuber moth). Powdered naphthalene has given poor results, and tests were therefore made with paradichlorobenzene. It was found that in bottles containing paradichlorobenzene at the rate of 10 gms. per cu. m. heavily infested potatoes were freed from infestation in 48 hours, all larvae in the tubers being then dead, while the germination of the tubers was unimpaired. In stores where the potatoes cannot be treated as accurately as in sealed bottles, it is nevertheless probable that about 1 oz. of the paradichlorobenzene per 35 cu. ft. of space would be a practical remedy, and the expense is negligible.

PAILLOT (A.). **Existence de la grasserie chez les papillons de ver à soie.**—*C. R. Acad. Agric. France,* xii, no. 2, pp. 57–63, 4 figs. Paris, 1926.

The author disagrees entirely with the findings of Rebouillon regarding the discovery of grasserie in silkworm moths [*Bombyx mori,* L.] by macroscopical and microscopical investigation [*R.A.E.*, A, xiii, 594]. He has definitely proved by experiment that the causative organism of grasserie can pass from the larval to the adult stage, and briefly reviews the facts. He considers it impossible to distinguish diseased from healthy adults by macroscopical examination, the results of even microscopical investigation being uncertain, and points out that diseased adults do not present the typical features described by Rebouillon. However, since it has been proved that the adults can carry the disease and pass it on to the egg, it is hoped that a method may be devised of selecting adults so as to ensure healthy eggs. It has already been observed that keeping cocoons in a hot atmosphere considerably increases the number of deaths due to grasserie, and it is possible that carriers of the virus might be eliminated by a judicious application of heat.

POUTIERS (R.). **La destruction des insectes nuisibles par leurs parasites.** —*Progrès agric. & vitic.*, lxxxv, no. 4, pp. 83–89, 1 pl. Montpellier, 24th January 1926.

This is a popular account of the best known cases of biological control of insect pests by parasites and predators.

FERRIÈRE (C.) & FAURE (Jean C.). **Contribution à l'étude des Chalcidiens parasites de l'***Apanteles glomeratus*, **L.**—*Ann. Epiphyties,* xi, no. 4, pp. 221–234, 5 figs., 24 refs. Paris, July–August 1925. [Recd. January 1926.]

The authors do not agree with the findings of Picard regarding the identity of *Tetrastichus rapo*, Wlk., and its hyper-parasitism of *Pieris brassicae,* L. [*R.A.E.*, A, ix, 557 ; x, 359]. Further study has led them to the conclusion that there are two species of *Tetrastichus* parasitic on *Apanteles glomeratus*, L., namely, *T. rapo*, which oviposits in the larvae of *Apanteles* or of *Anilastus ebeninus*, Grav., while still in the body of the Pierid, and *T. galactopus*, Ratz., which is the species recorded by Picard and which oviposits in the larvae of the same hosts when in their cocoons. The differences between these two species of *Tetrastichus* are merely of colour, but they are decisive and consistent. The synonymy and previous records of the hosts of the two species are discussed.

Descriptions are given of *Homoporus luniger*, Nees, var. *braconidis*, n. (with a key including *H. crassinervis*, Thoms., *H. flaviscapus*, Thoms., & *H. luniger*, Nees), and of *Schizonotus pailloti*, sp. n., from cocoons of *Apanteles glomeratus*. The latter parasite was also reared on cocoons of *Anilastus ebeninus*, though probably in nature it is an exclusive parasite of *Apanteles*. The larva is an external parasite and can move about on its host, the adult feeding by means of a suction tube, as does *H. luniger* var. *braconidis*. A key is given to *S. pannewitzi*, Ratz., *S. sieboldi*, Ratz., and *S. pailloti*.

LÉCAILLON (A.). **Le négril de la luzerne** (*Colaspidema atrum*, **Olivier**). **Etude monographique.**—*Ann. Epiphyties*, xi, no. 4, pp. 235–298, 2 pls., 34 refs. Paris, July–August 1925. [Recd. January 1926.]

In this monograph a detailed account is given of *Colaspidema atrum*, Oliv., some of the information having been noticed from earlier and shorter papers [*R.A.E.*, A, xi, 188, 243, etc.]. The young larvae make small holes in the leaves, ultimately leaving only the midrib, so that by the time they are mature (generally towards the end of June), the lucerne fields may be ruined. If the crop is cut early, the plants will grow again and are generally free from the pest, but when the young plants are badly attacked from the beginning of their growth they may be too weak to grow again. Parasites at present known include *Meigenia floralis*, Meig. [*R.A.E.*, A, vi, 171] and (though much less important) *Minella nitens*, Zett., a larval parasite. Further study would probably reveal other parasitic species. As *Meigenia floralis* is also a parasite of *Crioceris asparagi*, Oliv. (asparagus beetle), and can complete its development on that species, there seems no reason why it should not be bred for use against *Colaspidema atrum*.

Artificial remedies have been very little used, at least in France. Early mowing of the crop cannot be considered a sufficient remedy, as it only kills the very young larvae ; the most important measure is the destruction of the adults immediately after their emergence. Poultry are useful in destroying both adults and larvae. Hand collection has not proved very satisfactory, as the insects easily fall to the ground and are then very difficult to find. Various nets and other implements for sweeping are described. The author recommends that when the crop is cut, small areas should be left intact, as well as a border 2 or 3 ft. wide all round the field, in which the insects will shelter instead of migrating, and where they can then easily be caught by sweeping. The moment chosen for cutting the crop depends on the growth of the plants and the abundance of the insects. Various insecticidal treatments suggested by other writers are discussed, among which a dust of calcium cyanamide, gypsum and wood ash applied to the second crop is said to have given success. Arsenical treatment is said to have proved successful in Spain, but great care is requisite to make the applications correctly and to ensure that there is no danger to stock in feeding on forage so treated. Disinfection of the soil harbouring the hibernating insects does not seem to be practicable. To protect fields against migrating insects their borders should be treated with the dust described above.

POUTIERS (R.). **L'état actuel de la lutte contre la fourmi d'Argentine** (*Iridomyrmex humilis*, **Mayr) en France.**—*Ann. Epiphyties*, xi, no. 4, pp. 301–311, 6 figs. Paris, July–August 1925. [Recd. January 1926.]

The campaign that has been undertaken in France, and more particularly at Cannes, for the control of *Iridomyrmex humilis*, Mayr (Argentine ant), which was preventing the growing of vegetables and market-gardening in many districts, has produced excellent results, and the problem of keeping it in check is now considered solved, though isolated outbreaks are still likely to occur and must be dealt with promptly. The principal measure adopted was the use of weak poison baits [*R.A.E.*, A, viii, 285]. The formula finally recommended was a solution of 473 parts by weight of white sugar, 2 of sodium arsenite, 0·61 of tartaric acid and a little sodium benzoate and colouring matter, boiled together in water, the amount of water being kept up, as it evaporated, to maintain a total of 1,000 parts by weight. This was superior to a bait containing honey, as it did not ferment. Trees infested with Aphids and Coccids that are sought by the ants were isolated by means of bands of adhesive, while bait-traps were placed lower down on the trunks to attracts the ants when they found that they could not cross the adhesive barrier. An improvement on the shelter-traps used in the winter [*R.A.E.*, A, ix, 251] has been devised, which at the same time is a bait-trap. In the middle of the trap among the decomposing matter is placed a small aluminium cylindrical tin containing toxic syrup. Several narrow, lateral slots just below the lid allow of entrance and exit of the ants. This apparatus obviates the use of carbon bisulphide, and is acting all the time, only requiring occasional attention. During the spring, watch is kept in places likely to shelter ants, and if nests are found they are treated with a 2 per cent. solution of lysol or a 10 per cent. solution of cresyl. Light-traps for adults were found to be useless as they only attracted a few males.

GORJAT (R.). **Etude comparative des différents moyens de lutte contre les vers de la vigne.**—*Terre vaudoise*, xvii, no. 52, pp. 767–769; xviii, nos. 1 & 2, pp. 9–10 & 21–23. Lausanne, 26th December 1925, 2nd & 9th January 1926.

A general review is given of conditions in the vineyards of Vaud with regard to infestation with the vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.]. Particulars are given of various treatments that were tried in the course of 1925. The general indications are that disbudding should be practised before the treatment against the first generation with nicotine or pyrethrum; then, if Pyralids [*Sparganothis pilleriana*, Schiff.] are numerous, they can be destroyed in a large measure by the addition of arsenicals to the second or third sulphur treatment. For use against the second generation, an insecticidal powder to supplement nicotine treatment is needed. The second treatment is evidently important as it was found to produce a larger crop and a more uniform quality of fruit, and every effort should be made to induce the owners of vineyards to practise it.

Faes (H.) & Tonduz (P.). **Rapport annuel-1924. Station fédérale d'essais viticoles à Lausanne et domaine de Pully. A. Division de physiologie et pathologie végétale.**—*Ann. agric. Suisse,* xxvi, no. 5, pp. 657–665. Berne, 1925.

Of various remedies that are being tried against the vine moths [*Clysia ambiguella,* Hb., and *Polychrosis botrana,* Schiff.], the best results have so far been obtained with pyrethrum-soap solutions, provided that the time of application is correctly judged. Good results were also obtained with dusts having a basis of quick lime and calcium carbide. On fruit trees sticky bands will prevent the ascent of winter moths [*Cheimatobia brumata,* L.], which will thus be forced to lay their eggs on the trunks below the bands. In this position they may be destroyed by spraying with a 4 per cent. solution of crude lysol, a strong lime-sulphur solution, or 10 per cent. soluble carbolineum. With the first two some of the eggs escaped, both under experimental and field conditions, but the third can be recommended as absolutely reliable.

Faes (H.). **La cochenille *Icerya purchasi,* un parasite nouveau pour la Suisse.**—*Ann. agric. Suisse,* xxvi, no. 5, pp. 679–682, 2 figs. Berne, 1925.

Icerya purchasi, Mask., is recorded from Tessin on *Acacia dealbata* and *Citrus.* Where its occurrence is limited, it is advisable to burn the attacked trees, but in the case of more widespread infestation, biological control is necessary. *Novius cardinalis,* Muls., has therefore been imported from Mentone and has already destroyed large numbers of *I. purchasi* at Lugano.

Savastano (L.). **Talune notizie sul *Novius* e l'*Icerya* riguardanti l'arboricoltore.** [Some Notes for the Fruit-grower on *Novius cardinalis* and *Icerya purchasi.*]—*Boll. R. Staz. speriment. Agrum. Fruttic.,* no. 53, 2nd edn., 2 pp., 2 figs., 1 pl. Acireale, June 1925. [Recd. January 1926.]

This is a reprint of a popular bulletin already noticed [*R.A.E.,* A, vii, 413].

Trabut (L.). **A propos de la désinfection des graines du cotonnier.**—*Bull. agric. Alg.-Tun.-Maroc.,* xxxii, no. 1, pp. 1–2. Algiers, January 1926.

The author points out that the chloropicrin or sulphuric acid treatment of cotton seed as tested in France [*R.A.E.,* A, xiv, 9], while doubtless efficacious against pests attacking the outside of cotton seed, is useless against pink bollworm [*Platyedra gossypiella,* Saund.], which lives within the seed. Heat seems to be the only effective treatment for this pest, and will kill up to 98 per cent. of the larvae, but sufficient still remain to continue the infestation, and the germination of the seed is affected. The best remedy would be to exclude imported seed or to introduce it in such small quantities that thorough inspection could be made.

de Fleury (P.). **Etude biologique sur** *Anaphe ambrizia* **(Btlr.)** (?) **de la Guinée française et examen technique de sa soie.**—*Ann. Soc. ent. France,* xciv, pt. 4, pp. 405–420. Paris, 31st December, 1925.

The author calls attention to an account published in the Compte rendu du Laboratoire d'Etudes de la soie de Lyon, Volume xvi, 1919–23, of the silken nests constructed by the larvae, particularly of the genus *Anaphe,* and of their possible commercial value. In biological observations made in French Guinea on *A. ambrizia,* Butl. (?), the larvae were found to pupate in large nests firmly attached to the branches. They are found on several species of trees, one of those identified being *Anisophylla laurina.* Emergence of the adults begins in early May. Several nests have been found to contain only mummified bodies of larvae ; these may have been killed by a disease or by the bush fires that rage from December to March over large areas. Birds do not appear to eat the larvae, but the natives devour them with relish and reduce their numbers considerably. There are two larval parasites, a Tachinid, probably *Tachina onchestus,* Wlk., and a minute black Hymenopteron, but these are not apparently of much importance in normal years. Wherever the favourite food-plants occur, bush fires should be controlled, and though it is not thought possible to rear the larvae on the same lines as *Bombyx mori,* L., it is suggested that their food-plants should be allowed to grow extensively in the immediate vicinity of villages, so as to create a reserve where the moths could breed freely. Other silk nests found in French Guinea include those produced by moths of the genus *Coenostaegia* [*R.A.E.*, A, xii, 342], which the author considers equal to other exotic silks. One drawback to their use is the amount of débris in the form of twigs, etc., that the nests contain, and it is doubtful whether the separate cocoons would be worth using for silk production, but these points require further investigation.

Hall (W. J.). **Notes on Egyptian Coccidae with Descriptions of New Species.**—*Minist. Agric. Egypt,* Tech. & Sci. Serv., Bull. 64, 31 pp., 6 pls. Cairo, 1925. [Recd. February 1926.]

Among the species dealt with in the first part of this paper the following are described as new : *Aspidoproctus hyphaeniacus,* on *Hyphaene thebaica* ; *Antonina indica,* Green, var. *panica,* on *Panicum turgidum* ; *Phenacoccus inermis,* on roots of *Cleome arabica,* and other plants ; *Pseudococcus aegyptiacus,* on sugar-cane (*Saccharum officinarum*) ; *Trionymus masrensis,* on *Imperata cylindrica* ; *Aspidiotus ostreaeformis,* Curt., var. *aegyptiacus,* on *Ficus carica* ; and *Chionaspis noaeae,* on *Noaea mucronata.*

The second part gives additional information on species previously recorded [*R.A.E.*, A, x, 494 ; xii, 196, 565], and in the third, the list of food-plants of these species is brought up to date.

Decary (R.). **Les invasions de Criquets à Madagascar** (*Pachytilus migratorioides* **Reich.**).—*Bull. Soc. ent. France,* 1925, no. 17, pp. 290–292, 5 refs. Paris, 1925. [Recd. January 1926.]

Previous records of locust invasions in Madagascar are briefly reviewed ; they have occurred roughly at intervals of 10 years. The last invasion of *Locusta* (*Pachytylus*) *migratoria* ph. *migratorioides*, Rch. & Frm., occurred in 1924–25 and caused considerable damage in the rice-fields. In the extreme south of the island, where it is too dry for the cultivation of rice, the swarms pass through without causing any serious damage, and are, in fact, welcomed by the natives as an unexpected source of food. The swarms probably originate from a few individuals flying over from the mainland of Africa ; these increase gradually and remain unnoticed until they invade the rice-fields in large numbers. These swarms could easily be prevented by systematic destruction of the few original invading individuals.

LOUNSBURY (C. P.). **Report of the Division of Entomology 1924-25.**—*Jl. Dept. Agric. Union S. Africa*, xi, no. 6, pp. 577–586. Pretoria, December 1925.

It was the author's opinion that crops in South Africa did not suffer so much from depredations of native insects as some other countries, notably Canada and the United States ; recently, however, since agriculture and horticulture have assumed far greater commercial importance, many indigenous insects have adapted themselves to various cultivated crops, and cause considerable damage. The more important of these are *Busseola fusca* (maize stalk borer), *Diparopsis castanea* (red cotton bollworm) and *Argyroploce leucotreta* (false codling moth). The last named has become a serious pest of oranges in various summer rainfall districts. The pre-eminence of these pests is a direct result of the disturbance of natural conditions.

Locustana pardalina continues to be a serious pest, but its depredations are expected to decrease within the next few years. *Nomadacris* (*Cyrtacanthacris*) *semptemfasciata* has not been recorded during the year. The precautionary measures against the establishment of *Pyrausta nubilalis* described in the previous report [*R.A.E.*, A, xiii, 111] have been continued throughout the year, and so far there is no indication that this pest has occurred away from the moth-proofed building in which imported broom corn is stored. Complaints have been made that South African broom corn is more heavily infested with borers than that imported from South America and Europe ; the species concerned, however, is the native maize stalk borer, *Busseola fusca*. The eucalyptus snout beetle [*Gonipterus scutellatus*] is still spreading ; preparations are being made for dusting from aeroplanes, but it will probably be many years before this pest is controlled, and in the meantime the wisdom of planting the more susceptible kinds of *Eucalyptus*, particularly *E. viminalis* and *E. globulus*, anywhere in the country is open to serious question. The pernicious scale [*Aspidiotus perniciosus*] continues to advance in the northern Provinces, and the risk of its introduction into the Cape is increasing ; for this reason additional regulations were brought into force during the year under review.

Tylenchulus semipenetrans (citrus Nematode) has been discovered in various nurseries. It can only be detected by microscopical examination of the fine roots. It must be assumed that it is harmful to the trees, but owing to the difficulty of detection, its dissemination cannot be prevented. Common lawn grass, *Cynodon* sp., was found to be heavily infested with *Tylenchus tumefaciens*, a gall-forming Nematode. The infested area has been placed under quarantine.

WILLIAMS (R. H.). **Locust Administration.**—*Jl. Dept. Agric. Union S. Africa,* xi, no. 6, pp. 587–597, 1 map. Pretoria, December 1925.

The locust campaigns carried out during 1924–25 are reported on as in the previous year [*R.A.E.*, A, xiii, 112]. The expenditure of approximately £500,000 was well justified by the saving of many millions sterling. During the season, 550,000 gallons of concentrated poison were issued, which is less than during the previous season; dusting, however, was done on a larger scale, 75 tons of sodium arsenite powder being used in addition to the liquid poison. In the Union a total of 832,896 swarms was destroyed, and in Bechuanaland and South-West Africa 33,575 and 86,900 respectively. A large number of the locusts were destroyed by the fungus, *Empusa grylli.* The value of locust birds against the locusts is somewhat doubtful, as they choose for preference those that are parasitised, and the flying locusts when attacked by them immediately return to the Kalahari, where the birds will only follow so long as the water supply lasts. From these returning swarms, fresh invasions may be expected the following year.

Departmental Activities. Entomology.—*Jl. Dept. Agric. Union S. Africa,* xii, no. 1, pp. 12–18. Pretoria, January 1926.

Cutworms have been particularly destructive in Natal, the attack being attributed to the heavy rains during March, which favoured the winter weed growth and thus enabled large numbers to survive the winter. The new bait [*R.A.E.*, A, xiii, 39] was not recommended for use amongst maize, pending further study on the cost, the figures for which have now been found to be 5*s.* 6*d.* per acre when broadcast at the rate of 200 lb. per acre, or 3*s.* per acre if the plants (12,500 per acre) are individually baited after they appear above ground. These figures do not include labour costs. The bait also proved attractive to adults of *Pyrameis cardui* and *Pieris* spp.

The following notes are taken from the Report of Elsenburg School of Agriculture for October 1925, by Dr. Pettey: *Heliothis* (*Chloridea*) *obsoleta* was very abundant in the Cape causing serious damage to the fruit crop, particularly stone fruits. Numerous eggs were found on peach fruit and on peas. The tree-crickets injurious to peaches were found to have hatched from eggs laid in the previous summer on wild blackberry (*Rubus rigidus*), *Salvia* spp., and *Anthospermum aethiopicum,* particularly the last named. Veldt burning near the orchard will largely destroy them, and early winter pruning may effectively dispose of eggs deposited on orchard trees without burning the twigs, as no eggs were found to hatch from cut twigs.

V. D. MERWE (C. P.). **The Maize Jassid** (*Balclutha mbila* **Naude**).—*Jl. Dept. Agric. Union S. Africa,* xii, no. 1, pp. 75–77. Pretoria, January 1926.

The technique employed for the study of *Balclutha mbila,* Naude, transmitting agent of streak disease of maize [*R.A.E.*, A, xii, 468; xiii, 393] is described. The eggs are inserted into the leaf substance and hatch in from 9 to 21 days, the longest period occurring with eggs laid about the end of August. The adult stage is reached in 18 to 31 days, according to temperature conditions, and oviposition begins about 6 to 15 days later. One female laid 339 eggs in 36 days. This

Jassid is commonly found on maize and sugar-cane in Natal. It has been successfully fed on Napier fodder grass and *Digitaria* sp. and will probably thrive on most grasses. An unidentified parasite attacks the eggs.

CHITTENDEN (F. H.). U.S. Bur Ent. **Historical Notes on *Brachyrhinus rugifrons* Gyll.**—*Canadian Ent.*, lvii, no. 12, pp. 290–291, 1 fig. Orillia, Ont., December 1925.

The various references to the occurrence of *Otiorrhynchus* (*Brachyrhinus*) *rugifrons*, Gyll., in Canada and the United States are briefly reviewed. This weevil was apparently introduced from two directions, Europe and Asia, and possibly first appeared in Canada. The introductions into California and Washington are undoubtedly independent of those in the east. The species does not occur in the central States between Pennsylvania and the Pacific Coast.

CURRAN (C. H.). **Descriptions of two Insects found in Imported Foodstuffs.**—*Canadian Ent.*, lvii, no. 12, pp. 292–293, 1 fig. Orillia, Ont., December 1925.

A Psocid, *Caecilius nigrotuberculatus*, sp. n., was found amongst maize from Argentina, and a Sciarid, *Sciara transpacifica*, sp. n., amongst ginger roots from China. Neither is likely to prove of much economic importance, and it is improbable that either could become established in Canada owing to the severe winters.

TULLIS (M. P.). **Destruction of Grasshoppers.**—*20th Ann. Rept. Dept. Agric. Saskatchewan, 1924-25*, pp. 150–151. Regina, 1925. [Recd. January 1926.]

During the period 1919–1923, the amount of bait used for the control of grasshoppers in Saskatchewan was 35,656 tons, the cost of supplies totalling about £174,266, while it is estimated that 3,529,612 acres of crops were saved as a result of the campaign. During 1923 some damage was reported to grain heads by winged adults, but during 1924 no campaign was necessary, the few slight outbreaks that occurred being easily handled by the local authorities with supplies carried over from 1923. This cycle of destruction by grasshoppers now seems to be over, and the numbers are again normal.

DAVIAULT (L.). **Les Cicadelles, ennemis de nos plantes potagères.**—*Sci. Agric.*, vi, no. 5, pp. 169–172, 1 map. Ottawa, January 1926.

Jassids are very abundant in Montreal, causing a type of leafburn that results in serious losses to vegetable crops. The most numerous include *Cicadula sexnotata*, Fall.; *Helochara communis*, Fitch; *Empoasca fabae*, Harr. (*mali*, LeB.); and *Parabolocratus viridis*, Uhler. They attack certain weeds as well as cultivated crops, of which their favourites seem to be lettuce, spinach and celery. The life-history of *C. sexnotata* is described. There are probably three generations annually in Montreal, with a partial fourth, nymphs of the fourth generation and adults of the third overwintering. The best remedy is Bordeaux mixture used as a repellent during the growing period; this should be applied about every 10 days, covering both sides of the leaves. A dust of precipitated sulphur and nicotine has proved slightly less successful, but is useful on plants nearly ready for market as the dust is readily removed by washing with water.

Quarantine on account of the Satin Moth. Notice of Quarantine no. 53, with Regulations, revised.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 3 pp. Washington, D.C., 3rd November 1925.

The States of Maine, New Hampshire, Massachusetts, Rhode Island and Washington are quarantined on account of *Stilpnotia salicis*, L., and certain districts in them designated as infested areas. The movement of poplars and willows from such areas is prohibited. These regulations supersede former ones [*R.A.E.*, A, x, 596].

Severin (H. C.). **Department of Zoology-Entomology.**—*Ann. Dept. S. Dakota Agric. Expt. Sta. 1923–4*, pp. 22–25. Brookings, S.D. [n.d.] [Recd. January 1926.]

Further study of *Gryllus assimilis*, F., common field cricket, in South Dakota, where a lucerne seed crop may be destroyed in a few days, has shown that the numbers can be greatly reduced by exposing the eggs for 3 or 4 hours, when they will shrivel up and die. This can be done by a spring-tooth cultivator run lengthwise and crosswise over the field in late autumn and early spring. The edges of the fields and the sides and tops of irrigation ditches should be similarly treated. Very good results have been obtained by the use of the bait advocated in the last report [*R.A.E.*, A, xiii, 89]. Many poison baits for *Meromyza americana*, Fitch (wheat stem maggot) were tried ; all the essential oils tested proved negative, as was molasses alone ; molasses with vinegar or with yeast gave fair results, as well as several kinds of alcohol. As the adults feed on freshly mown grass, a material having the odour of newly mown hay, obtained synthetically, or directly from the tonka bean in the form of coumarin, was used as an attractant and seems to be promising ; the best methods for its use are being tested.

Barber (G. W.). U.S. Bur. Ent. **Observations on the Response of Adults of the European Corn Borer to Light in Egg Laying.**—*Ann. Ent. Soc. Amer.*, xviii, no. 4, pp. 419–431. Columbus, Ohio, December 1925.

The adults of *Pyrausta nubilalis*, Hb., were subjected for various periods to constant light and constant darkness, in order to ascertain the effect these conditions would have on the length of life of individuals and on the number of eggs they would lay. Constant light, increased hours of light each day, alternating light nights, or periods of a few days under constant light, caused a considerable reduction in the number of eggs, while constant darkness or alternating dark days stimulated the production of eggs by adults under such conditions.

Teague (M. M.). **A Review of the Genus** *Aclerda* **(Hemiptera ; Coccidoidea).**—*Ann. Ent. Soc. Amer.*, xviii, no. 4, pp. 433–441, 3 pls. Columbus, Ohio, December 1925.

The material upon which the review is based is contained for the most part in the Stanford Collection of Coccidae. Only the adult females are dealt with ; they comprise 9 species including *Aclerda holci*, sp. n., from Louisiana on *Sorghum halepense*, and *A. sacchari*, sp. n., from Porto Rico on sugar-cane stalks and roots.

GILLETTE (C. P.) & PALMER (M. A.). **Two new Species of the Genus** *Lachnus.—Ann. Ent. Soc. Amer.*, xviii, no. 4, pp. 526–530, 10 figs., 1 pl. Columbus, Ohio, December 1925.

The species described are *Lachnus juniperensis* on *Juniperus sibirica* and *L. engelmanniensis* on *Picea engelmanni*, both from Colorado.

COOK (W. C.). **Some Weather Relations of the Pale Western Cutworm** (*Porosagrotis orthogonia* **Morr.). A Preliminary Study.**—*Ecology*, vii, no. 1, pp. 37–47, 6 figs., 7 refs. Brooklyn, N.Y., January 1926.

A study of the weather conditions preceding outbreaks of *Porosagrotis orthogonia*, Morr. [*cf. R.A.E.*, A, xii, 49, 164] in Montana, Colorado and New Mexico, shows that the total rainfall in May, June and July of the year preceding a cutworm outbreak is a factor of great significance. The critical amount of rainfall varies with the temperature and produces a definite, critical soil moisture. If the moisture exceeds the critical amount, the number of cutworms decreases in the following year, and the converse occurs if the moisture is less than the critical amount. The effect is cumulative, and severe outbreaks follow a succession of dry years. The author gives a series of climagraphs illustrating this.

The physiological factors responsible for this relation have not been definitely determined. It seems probable that fungous and bacterial diseases are of the greatest significance, that insect parasites are of secondary importance, and that there may be a direct physiological effect of moisture upon the larva and pupa.

LARRIMER (W. H.). U.S. Bur. Ent. **Behaviour of** *Phytophaga destructor*, **Say, under Conditions imposed by Emergence Cages.**—*Jl. Agric. Res.*, xxxi, no. 6, pp. 567–574, 2 figs., 8 refs. Washington, D.C., 15th September 1925. [Recd. January 1926.]

The author describes a number of emergence cages constructed for the purpose of determining the time and extent of emergence of adults of *Mayetiola* (*Phytophaga*) *destructor*, Say (Hessian fly) from pupae under varying conditions. Details of emergence in the various cages are discussed, but a fuller account of the results of experiments, and the part played by emergence cages will be published later. To obtain emergence records that are most closely associated with infestation of wheat, investigators rely almost entirely on egg counts and examination of pupae, these methods having the advantages of simplicity, economy and accuracy. The practical application of the emergence cages to Hessian fly investigations is confined principally to life-history and control work rather than to prediction of outbreaks.

CAMPBELL (F. L.). **Insect Toxicology.**—*Science*, lxiii, no. 1619, pp. 45–46. Garrison, N.Y., 8th January 1926.

Laboratory research on the effects of insecticides would develop more rapidly and fruitfully if laboratory and field workers alike had a single, definite conception of its purpose and potential importance. The author pleads for the building up of a quantitative system of insect toxicology both for stomach poisons and contact insecticides on a few suitable laboratory insects.

Practical results already secured are cited.

MUMFORD (E. P.). **The Sugar-cane Froghopper.**—*West India Committee Circ.*, xl, no. 711, pp. 525–526. London, 31st December 1925.

The losses due to the so-called froghopper blight of sugar-cane in Trinidad have increased seriously in the past few years ; it is probably caused mainly by the root fungi, *Marasmius* and *Odontia*, and the froghopper, *Tomaspis saccharina*, but is not due solely to any one of these. The direct methods of control of *T. saccharina*, spraying, introduction of insect parasites and predators, and artificial propagation of the green muscardine fungus, *Metarrhizium anisopliae*, which infests the froghoppers, have not met with any lasting success, but should receive further investigation. It has been definitely proved that the onset and persistence of the attacks of the root fungi of sugar-cane are dependent on weakness of the plants caused by unfavourable soil conditions, and it is known that severe infestation by insects injurious to various plants is similarly related to soil conditions ; it therefore seems possible that the solution of the froghopper problem lies in adequate and correct cultivation, by which means the resistance of the sugar-cane to various insect and fungus pests may be increased.

FELIZARDO (J. G.). **Doenças e inimigos das abelhas.** [Diseases and Pests of Bees.]—*Egatea*, x, no. 6, pp. 483–488, 3 figs. Porto Alegre, November–December 1925.

Insect enemies of bees in Brazil include the wax moth, *Galleria mellonella*, L. (*cerella*, F.) ; ants, especially *Camponotus cingulatus*, Mayr ; the bee louse, *Braula coeca*, Nitz. ; and a bug, *Triatoma* (*Conorhinus*) sp. The usual remedies for the first three are quoted.

ALEXANDER (W. B.). **Natural Enemies of Prickly Pear and their Introduction into Australia.**—*Commonw. Australia, Inst. Sci. & Indust.*, Bull. 29, 80 pp., 13 pls. Melbourne, 1925. [Recd. January 1926.]

The scheme outlined in 1919 [*R.A.E.*, A, vii, 481] has been in operation since June 1920 under the organisation of the Commonwealth Prickly Pear Board, the activities of which from that date until June 1924 are described. At the beginning of the work it was estimated that no results could be obtained under 5 years, and no definite statement as to the success of the experiment can yet be expected. A great deal of the information has already been noticed [*R.A.E.*, A, ix, 565 ; x, 415 ; xi, 582 ; xii, 374 ; xiii, 558].

An account is given of the staff and equipment and of the transportation of insects, with an outline of each year's work in America and Australia.

BEZZI (M.). **A New Tachinid (Dipt.) from Australia, with Notes on the Forms with obliterated fourth Vein.**—*Ann. & Mag. Nat. Hist.*, xvii, no. 98, pp. 236–241, 1 fig. London, February 1926.

Actia eucosmae, sp. n., was bred in Queensland from *Crocidosema* (*Eucosma*) *plebeiana*, Zell. Keys are given to the known species of *Actia* with obliterated fourth vein, and to the Tachinid genera in which the fourth vein may be more or less obliterated at the apex.

FROGGATT (W. W.). **Notes on Australian Coccidae with Descriptions of New Species.**—*Proc. Linn. Soc. N.S.W.*, l, pt. 4, pp. 378–380. Sydney, 15th December 1925.

The Coccids described are *Lecanium eucalypti*, sp. n., from a cavity in the stem of a small *Eucalyptus* tree associated with *Cremastogaster* sp.; *L. dixoni*, sp. n., from a cavity in the stem of *Loranthus* parasitic on *Eucalyptus* sp.; and *L. callitris*, sp. n., from cavities under the bark of the desert cypress (*Callitris calcarata*).

YOUNG (J. D.). **Combating Cotton Insect Pests.**—*Australian Cotton Grower, Farmer & Dairyman*, i, no. 12, pp. 4–7. Brisbane, 1st December 1925.

The importance of bird protection in Queensland is pointed out. While insect damage in the cotton belt is not generally of a very serious nature, there are a number of caterpillars, such as the maize grub [*Heliothis obsoleta*], peach worm [*Dichocrocis punctiferalis*] and rough bollworm [*Earias huegeli*], that can be considerably reduced by the protection of bird life, aided by such measures as cleaning up the cotton fields after the crop is picked, good winter cultivation, and the use of maize as a trap crop. These measures, with the exception of the last, would also be useful against the pink bollworm [*Platyedra gossypiella*].

FRENCH jr. (C.) & LEVICK (G. T.). **The Pear Root Aphis** (*Eriosoma pyricola*).—*Jl. Dept. Agric. Victoria*, xxiii, pt. 11, pp. 684–685. Melbourne, November 1925.

An Aphid causing considerable injury to the roots of pears during the past four or five years has now been identified as *Eriosoma pyricola*, Bak. & Dav. [*R.A.E.*, A, iv, 369]. So far as is known the whole of the life-history occurs on roots of pears in Australia. Soil fumigants appear to be the most promising measure for its control. Paradichlorobenzene applied at the rate of 2½ oz. per tree, scattered on the surface of the soil and dug in, or placed at a depth of 6 inches around the tree, killed all the Aphids, and the fumes were still in the soil after three months. Even as much as 20 oz. did not appear to injure the trees. Calcium cyanide dust and red oil (1 : 15) were less successful as they affected the root system. All experiments were made during the dormant season. In addition to the usual dipping before being sent out from the nursery, all young stock should be dipped before planting in a solution of 1 lb. 40 per cent. nicotine sulphate in 80 gals. water with 3 lb. soap, or in miscible oil, 1 : 40.

GURNEY (W. B.). **The Control of Fruit Fly.**—*Agric. Gaz. N.S.W.*, xxxvi, pt. 12, pp. 879–887, 5 figs. Sydney, 1st December 1925.

This is a brief review of the methods employed for the control of *Ceratitis capitata* and *Dacus ferrugineus*. The eggs cannot be reached by sprays, and no parasites of this stage have been discovered. Parasites of fruit-fly larvae, which occur in them when they infest wild fruits, are ineffective when they infest the large, fleshy cultivated fruits. The effect of cold storage on the larvae in fruit is somewhat doubtful; although the author has obtained good results [*R.A.E.*, A, xi, 474], it was found in South Africa that under certain conditions the larvae could survive for six weeks at 34–35° F. [*R.A.E.*, A, xi, 570]. Recently, the author tested the effect of exposure of fruit containing larvae alternately to cold storage at 34–35° F., and normal temperature, at intervals of three days. This was not so effective as continued cold storage for three weeks, but it is proposed to test the effect of contrasted temperatures at longer intervals. Soil fumigation against fruit-flies in the pupal stage would only be warranted if it was proved that the winter is passed in this stage by a considerable proportion of the flies. Baits, both poisoned and in traps, have given unequal results against the adults of the fruit-flies. The results of spraying a small patch of the foliage of each tree with lead arsenate, molasses and fruit syrup have likewise been unequal, and mainly unsatisfactory; this is apparently due to the low toxicity of the lead arsenate in the formula and may perhaps be remedied by replacing it by calcium arsenate or sodium arsenite [*R.A.E.*, A, xiii, 641]. It is proposed in the coming season to test the efficacy of painted boards dipped in the spray solution and hung in the trees, in place of spraying. This method, if effective, would obviate the danger of spray injury to fruit and leaves, and would do away with the need for a spray pump and reduce the labour of application. Investigations carried out some years ago showed that *C. capitata* does not develop in wild fruits in New South Wales, and it is now believed that the form of *Dacus ferrugineus* that damages cultivated fruits is not the same as that found in wild fruits. It therefore appears that the danger of wild fruits serving as a source of infestation for cultivated ones is small. Experiments in spraying pears with Bordeaux mixture have indicated that this substance possesses some value as a deterrent against oviposition by fruit-flies. Fruit-flies are not serious pests of *Citrus* in New South Wales, and the loss of fruit from this source rarely exceeds 1 per cent., though the infestation of stone-fruits later in the season is more serious.

JARVIS (E.). **Annual Report of Entomologist, 1924-25.**—*Queensland: 25th Ann. Rept. Bur. Sugar Expt. Stas.*, pp. 17–22. Brisbane, December 1925.

Most of the information contained in this report has already been noticed from the author's monthly ones. The use of carbon bisulphide as a soil fumigant against the larvae of *Lepidoderma albohirtum*, Waterh. (grey-back cane beetle) has decreased in recent years; this is due partly to disappointing results obtained by using it too late in the season, when the soil is not in a suitable condition, but chiefly to the lack of satisfactory mechanical appliances for injecting it into the soil. *Rhabdocnemis obscura*, Boisd. (weevil borer) is now a sufficiently serious pest to call for concerted action on the part of cane growers. Up to the present control measures against this weevil have been almost confined to the liberation of the Tachinid parasite, *Ceromasia sphenophori*, Vill., of which over 600 adults and 2,000 puparia were distributed during the year. The artificial control measures recommended include the use of bait-traps [*R.A.E.*, A, xiii, 452], the burning or stripping of cane trash, the effect of which is to remove the shelter frequented by the beetles, and the selection of clean seed cane. Natural enemies of *R. obscura* include rats, which destroy considerable numbers of larvae and pupae, the ant, *Pheidole megacephala*, F., which kills numbers of the larvae in their burrows before they are able to pupate, and the fungus, *Metarrhizium anisopliae*. A list is given of insects of economic interest bred during the year.

BURNS (A. N.) & MUNGOMERY (R. W.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxiv, pt. 6, pp. 516–517. Brisbane, 1st December 1925.

Opogona glycyphaga, Meyr. (sugar-cane bud moth), though a pest of comparatively minor importance, has been responsible for injury to the eyes of sugar-cane throughout the northern canefields of Queensland. Owing to their retiring habits the larvae are frequently unnoticed, and they obtain considerable protection from natural enemies by using the galleries of *Rhabdocnemis obscura*, Boisd. (weevil borer) and *Phragmatiphila truncata*, Wlk. (moth borer). There are several broods during the year, the average life-cycle lasting about 3 months, but varying according to the season. A brief description of the different stages of this pest is given. The Chalcid, *Stomatoceras gracilicorpus*, Gir., has been bred from it in the laboratory.

COTTRELL-DORMER (W.). **Cane Pests and Diseases.**—*Queensland Agric. Jl.*, xxiv, pt. 6, p. 518. Brisbane, 1st December 1925.

Lepidiota caudata is recorded from the Johnstone River area, where it is a minor pest of sugar-cane. Melolonthid beetles collected on the leaves of young plant cane have been identified as *Cheiragra* sp.

GIRAULT (A. A.). **A Systematic Note on an Imported Lucerne Pest with Description of two New Allied Species.**—*Queensland Agric. Jl.*, xxiv, pt. 6, p. 536, 2 refs. Brisbane, 1st December 1925.

The characters of *Bruchophagus funebris*, How., which was first observed in Australia in 1910, are discussed, and records of its occurrence in Queensland are reviewed. *Eurytoma larvicola*, sp. n., reared from *Agromyza phaseoli*, Coq., and *E. striatifacies*, sp. n., reared from a Braconid, parasitic upon *Cirphis unipuncta*, Haw., are described from Queensland.

FROGGATT (J. L.). **The Banana Weevil Borer** (*Cosmopolites sordidus* **Germ.**).—*Queensland Agric. Jl.*, xxiv, pt. 6, pp. 558–593, 9 pls., 9 refs. Brisbane, 1st December 1925.

This paper is largely a revision of matter published by the author and others, most of which has already been noticed in this *Review*. An account is given of the life-history and habits of *Cosmopolites sordidus*, Germ., in Queensland, with suggestions for remedial and preventive measures. Its various stages are described, and similar insects that might be mistaken for it are discussed.

The eggs are generally laid in a small burrow in the plant, at about ground level and hatch in from about 4 to 30 days according to the season. The larval stage usually lasts from 25 days in summer to 100 in winter. Eggs have not been found in the field in any parts of the plant showing decay, and in cases in which the larvae cannot mature before the material in which they are breeding becomes rotten, they usually die. The chief damage to the plant is done during the larval stage, and this is passed both in the heart of the corm and in the outer section. In both cases a large amount of tissue is destroyed, representing in the former, food-storage capacity, and in the latter, much damage to the roots. As a result the plant obtains less food from the soil, and its hold is weakened so that it falls over. There appears to be no appreciable difference in the amount of injury caused by the borer in different varieties of bananas where two or more are growing together. No other food-plants have so far been found in Queensland. The damage does not appear to be limited by climatic or geographical conditions, and the weevil is as prevalent on the mountain ranges as in the lowlands. As a rule, the larvae do not extend their tunnels more than a few inches above ground level in a growing plant, but after the bunch is cut they may travel along the whole length of the old stem and may even tunnel through the leaf bases. Old corms in the stools act as breeding grounds. When fully fed, the larva passes through a prepupal stage lasting about 3 days. The pupal chamber has always been found in the corm just underneath the surface of the bulb below ground level. The pupal stage varies very little from an average of about 8 days. The entire life-cycle may last from 28 to 180 days, with an average of 47. The emerging weevils eat their way through the thin coating of corm and enter the soil, in which the most if not the whole of their life is passed. The greatest emergence of the adults probably occurs in May and November, though pupae have been collected in the field in practically every month of the year. The employment of natural enemies has not met with any appreciable success so far ; the Histerid, *Plaesius javanus*, Er., has been imported from Java, but there is no evidence that it has become established in Queensland. Various remedial measures are being tested, including the application of paradichlorobenzene, which has given promising results as a deterrent, though it is too early yet for any definite conclusions. The usual bait methods and the precautions necessary in planting in order to prevent infestation are described.

CAMPBELL (T. G.). **The Emperor Gum Moth and its Allies.**—*Austr. Mus. Mag.*, ii, no. 9, pp. 315–318, 1 pl., 2 photos, 4 refs. Sydney, January–March 1926.

Besides various species of *Eucalyptus* and the pepper tree, *Schinus molle,* in Australia, the larvae of *Antheraea eucalypti* (emperor gum moth) also attack apple, to which they cause considerable damage.

FRIEDERICHS (K.). **Der Kaffeebeerenkäfer in Niederländisch-Indien.** [The Coffee Berry Beetle in the Dutch East Indies.]—*Zeitschr. angew. Ent.*, xi, no. 3, pp. 325–385, 18 figs., 108 refs. Berlin, December 1925.

This is a survey of the occurrence of the coffee-berry borer, *Stephanoderes hampei*, Ferr. (*coffeae*, Had.), in the Dutch East Indies and of the investigations that have been carried out on its biology and control. A bibliography of 108 references, extending from 1867 to 1924 and not confined to the Dutch Indies, is given. No effective biological control is considered possible except as the result of many years of investigation of all the circumstances pertaining to the biology of the pest in Uganda, where it is indigenous.

Schander (R.) & Kaufmann (O.). **Einführung des Blutlausparasiten *Aphelinus mali* (Hald.) nach Deutschland.** [The Introduction of the Woolly Aphis Parasite, *A. mali*, into Germany.]—*Zeitschr. angew. Ent.*, xi, no. 3, pp. 386–394, 9 figs., 4 refs. Berlin, December 1925.

In September 1923 apple twigs bearing *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., parasitised by the Chalcid, *Aphelinus mali*, Hald., were imported into Germany from Uruguay. Particulars of all the stages of the parasite are given. In Germany hibernation occurs in the larval stage in the host Aphids. The adults disappear with the advent of the first frosts or prolonged cold weather. The duration of hibernation depends on the prevailing temperature ; the adults appeared in the field on 24th April 1925, at which date the second generation from individuals that had appeared at the end of March in an unheated greenhouse was ovipositing. Though the winter of 1924–1925 was quite mild, there is no reason to suppose that a severe one would harm this parasite, as it appears to prolong or shorten its hibernation to suit the circumstances. Whether *A. mali* will become definitely established and represent an important check on *E. lanigerum* cannot be decided until some years have passed. It has a slow rate of spread and a limited radius of action, and the rate of increase of the woolly aphis appears to be much more rapid than that of the Chalcid. Efforts to cultivate varieties of apple resistant to the pest should be continued.

Speyer (W.). **Beitrag zur Wirkung von Arsenverbindungen auf Lepidopteren.** [A Contribution on the Action of Arsenical Compounds on Lepidoptera.]—*Zeitschr. angew. Ent.*, xi, no. 3, pp. 395–399. Berlin, December 1925.

As arsenicals are used in curative medicine, it is thought that they may sometimes exercise a healing action on diseased insects. This paper records some observations indicating that further research on the question is justified. Arsenic administered to silkworms (*Bombyx mori*) suffering from some form of polyhedral disease resulted in a larger percentage pupating.

Guenther (K.). **Untersuchungen an landwirtschaftlich schädlichen Insekten in Brasilien.** [Investigations on Insects injurious to Agriculture in Brazil.]—*Zeitschr. angew. Ent.*, xi, no. 3, pp. 400–414. Berlin, December 1925.

The Lygaeid, *Oxycarenus hyalinipennis*, and the pink bollworm, *Platyedra* (*Gelechia*) *gossypiella*, are both common on cotton bolls in the States of Pernambuco and Parahyba. In the case of the latter an average of 70 eggs per female was obtained in breeding-cages. Incubation lasted 5–10 days, and the larvae at once bored into cotton bolls. The larval stage lasted an average of 12 days, and the pupal 10. Moths were constantly emerging and ovipositing from July to October, when the author was breeding them, so that the destruction of the eggs by spraying would necessitate the application of an insecticide every 3 days, and this is not feasible in Brazil. When the larva is feeding on the seed, the boll bursts and its contents turn to a black, powdery substance that is attractive to other insects such as the caterpillars of *Pyroderces rileyi* and a Phorid fly. These insects are beneficial rather than harmful as they cause the bollworm, which often pupates in the burst boll, to be exposed to the attacks of birds, etc. In captivity the adult moths lived 14 days, but their life is probably longer in nature. The author rarely noticed the larval resting-stage in the field, but it occurred in captivity, thus supporting Willcocks' view that it is due to insufficient food and consequent failure to acquire the fat needed for metamorphosis.

The disinfection of cotton seed, the planting of cotton with a short growing period, the burning of severely infested fields and cleaning the ground to destroy larvae in the "resting stage," and crop rotation are the measures advocated, though conditions in Brazil are not favourable to the methodical application of such radical measures. Biological control is more likely to be successful there. Birds were found to be active destroyers of the larvae, especially *Polyoptila livida* and *Certhiola chloropyga*. Among insects, parasitic Hymenoptera rank first in importance. Costa Lima has recorded *Apanteles belthazari* and *Parasierola nigrifemur* from *P. gossypiella*, while the author found it to be attacked by *Bracon vulpinus* and Coccinellid beetles. That the indigenous Brazilian fauna is already exerting an influence on this imported pest is shown by the decrease of injury in districts where the cotton fields are surrounded by the normal flora. Forests also seem to check the spread of the moths.

In northern Brazil a weevil, *Gasterocercodes gossypii*, bores into the stems of cotton near the ground. Infested stems should be uprooted and healthy ones painted with a protective wash.

Coconut pests include the caterpillars of *Brassolis astyra*, which do much injury except in certain districts, where a bird, *Crotophaga ani*, exercises effective control. The weevil, *Rhynchophorus palmarum*, occurs everywhere, but does not kill the coconut palms. Two beetles, *Podalgus humilis* and *Ligyrus fossator*, are very harmful to sugar-cane. Lemons are infested by a Coccid, *Icerya purchasi*, and an Aleurodid, *Aleurothrixus floccosus*. *I. purchasi* is attacked by the Coccinellids, *Azya lutipes* and *Pentilia egena*, and the larva of *Chrysopa* sp. The latter attaches the scales to its own back, thus forming a waxy coat that protects it from the ants in attendance on the Coccid ; its pupa is similarly covered. Leaf-cutting ants, chiefly *Atta sexdens*, are a serious pest in Brazil, and the problem of their control is as yet unsolved.

The author emphasises the danger of planting extensive areas with a given crop ; and recalls that he drew attention in December 1923 to the danger presented by the uniform cultivation of coffee in S. Paulo. Six months later the presence of the coffee-berry borer, *Stephanoderes hampei* (*coffeae*) was detected, and the situation is now very serious. He suggests that as coffee is not grown in the valleys, the original forests there should be left untouched or, if cleared away, should be replanted. Such belts would be of great value in limiting an infestation, and their fauna would act as a check on pests of the cultivated crops.

WILLE (J.). **Uebersicht der landwirtschaftlich wichtigen Insekten von Rio Grande do Sul (Brasilien).** [A Survey of the Insects of Agricultural Importance in Rio Grande do Sul, Brazil.]—*Zeitschr. angew. Ent.*, xi, no. 3, pp. 415–426. Berlin, December 1925.

This list of pests noticed in the State of Rio Grande do Sul gives the names of 265 species arranged by orders, with the food-plants.

WÜNN (H.). **Die Coccidenfauna Badens. (6. Mitteilung.)** [The Coccid Fauna of Baden. (6th Communication.)]—*Zeitschr. angew. Ent.*, xi, nos. 2–3, pp. 273–296, 427–451, 1 map, 23 refs. Berlin, July and December 1925.

This list of Coccids found in Baden is on the same lines as one compiled for Alsace-Lorraine [*R.A.E.*, A, xiii, 394].

[DRYENOVSKĪ (A. K.)] DRENOWSKI (A. K.). **Eine neue Methode der Heuschreckenbekämpfung in Bulgarien.** [A new Method of combating Locusts in Bulgaria.]—*Zeitschr. angew. Ent.*, xi, no. 3, pp. 452–455, 1 fig. Berlin, December 1925.

In Bulgaria, where *Calliptamus italicus* and *Dociostaurus* (*Stauronotus*) *maroccanus* are serious pests, nets, similar to butterfly nets, have given excellent results in collecting the hoppers. The handle is about 3½ ft. long and 1–1⅛ inches thick. The ring is about 12 inches in diameter, of galvanized wire about ⅛–¼ inch thick, and is tempered at the point of attachment to the handle. The bags are about 19 inches deep. Hundreds of these nets, with spare rings and bags, have been distributed. The end of the handle is held in both hands and the bag is swung about once a second near the surface of the ground. When enough hoppers to form a mass the size of a fist have been collected, they are dumped on the ground and crushed underfoot. The workers advance over the ground in a regular line.

DINGLER (M.). **Ueber das Winterlager der Zangenböcke (Gattung *Rhagium*).** [On the Winter Quarters of Cerambycid Beetles (Genus *Rhagium*).]—*Zeitschr. angew. Ent.*, xi, no. 3, pp. 455–458, 3 figs. Berlin, December 1925.

Rhagium mordax, DeG., and *R. inquisitor*, L., hibernate as adults in their pupal chambers. *R. mordax* was thus taken from silver fir [*Abies pectinata*], so that it is not limited to deciduous trees, as generally stated.

RAMBOUSEK (F.). **Schädigungen und Krankheiten der Zuckerrübe vom 19 Mai bis 24 Juni 1925.** [Pests and Diseases of the Sugar-beet in Czechoslovakia from 19th May to 24th June 1925.]—*Prager Zuckermarkt*, Beilage z. *Zeitschr. Zuckerind. cechoslow. Republ.*, xlix, pp. 414–415, 425, 433, 450–451, 459–460. Prague, 1925. (Abstract in *Zeitschr. Pflanzenkr.*, xxxv, no. 7–8, pp. 323–324. Stuttgart, 1925.)

Euxoa segetum, Schiff., may be combated by isolating infested beet-fields by means of trenches filled with quick-lime, by turning loose poultry, and by trapping the moths in pans containing molasses or stale beer.

The beet-fly, *Pegomyia hyoscyami* var. *betae*, Curt., deposits up to 18 eggs in batches of 2–8 on the undersides of the leaves. The application of an evil-smelling substance prevents oviposition. Liquid stable manure may be sprayed, or saltpetre in dust form may be applied before rain. Infested leaves should not be removed, as this weakens the plant. Strips of material as traps may be covered with a mixture of 1 part crude glycerine and 5 parts water with the addition of 5 per cent. barium chloride and a trace of methyl or amyl alcohol. The parasite, *Opius nitidulator*, Nees, should be introduced. A heavy smoke cloud from tar is the only measure of any use against the second generation.

The caterpillars of *Arctia caja*, L., are a new beet-pest in Czechoslovakia.

FRICKHINGER (H. W.). **Eine Gefahr für den deutschen Weinbau.** [A Danger to German Viticulture.]—*Umschau*, xxix (1925), pp. 517–519, 5 figs. (Abstract in *Zeitschr. Pflanzenkr.*, xxxv, no. 7–8, pp. 328–329. Stuttgart, 1925.)

During the past 20 years the mite, *Eriophyes* (*Phyllocoptes*) *vitis*, Nal., has become a serious pest of grape-vines in Germany and Austria. The infested shoots form only short internodes and often die. The places where the new growths begin from the old wood must be painted with lime-sulphur mixture in early spring before the buds swell. This destroys the mites that collect there.

SCHEIDTER (F.). **Forstentomologische Beiträge. 1.** *Phytodecta viminalis* **L., eine ovovivipare Chrysomelide. 2. Die einzelnen Larvenstadien der gemeinen Kiefernbuschhornblattwespe,** *Lophyrus pini* **L. 3. Missetaten einiger Kurzrüssler.** [Contributions to Forest Entomology. 1. *P. viminalis*, an ovoviviparous Chrysomelid. 2. The larval Instars of the common Pine Sawfly, *Diprion pini*. 3. The damage done by some Weevils.]—*Zeitschr. Pflanzenkr.*, xxxvi, no. 1–2, pp. 6–24, 8 figs. Stuttgart, 1926.

The Chrysomelid beetle, *Phytodecta viminalis*, L., appears to hibernate a second time in the adult stage and to oviposit again in the following year. Eggs deposited on 20th May hatched at once, and the larvae passed through the first moult on 24th May, the second on 27th May, and the third on 30th May. By 4th June all the larvae had pupated under the ground litter. The tender leaves of aspen [*Populus tremula*] are eaten except for the stems. The parent beetle remains near her larvae and has been observed to drive away a Tachinid fly trying to oviposit on them.

The sawfly, *Diprion* (*Lophyrus*) *pini*, L., undergoes five larval moults, and of the six larval stages five are occupied in feeding, the sixth being spent almost entirely in the cocoon. Descriptions of these stages are given.

Of recent years the Curculionid, *Phyllobius psittacinus*, Germ., has caused some injury to the young shoots of spruce in May, near Munich. In one case it attacked a plantation of young spruce interspersed with deciduous trees, particularly mountain ash [*Sorbus aucuparia*], and these also were injured. In spruce not only the needles but also the shoots, especially the smaller ones, may be attacked and withered. Another weevil, *Polydrusus sericeus*, Schall., also feeds on the newly developed shoots as well as on the needles of older ones. *P.* (*Metallites*) *atomarius*, Ol., has been found feeding on the needles of silver fir [*Abies pectinata*] and spruce.

SCHMIDT (M.). **Ist der Getreideschmalkäfer ein Vorratsschädling?** [Is *Silvanus surinamensis* a Pest of Stored Products?]—*Mitt. Ges. Vorratsschutz*, i, no. 1, pp. 7–8; ii, no. 1, pp. 1–3, 1 fig. Berlin, November 1925 and January 1926.

In this discussion of the economic status of the grain-beetle, *Silvanus* (*Oryzaephilus*) *surinamensis*, L., the view accepted is that of Jablonowski, that this beetle is not actively injurious [*R.A.E.*, A, xiii, 202].

ZACHER (F.). **Die Bekämpfung der wichtigsten Mühlenschädlinge.** [Measures against the important Pests in Flour Mills.]—*Mitt. Ges. Vorratsschutz*, ii, no. 1, pp. 3–5. Berlin, January 1926.

This is a brief review of the measures usually recommended against pests in flour-mills, and contains no new information.

ANDRES (A.). **Etwas über den Speckkäfer und ähnliche Schädlinge.** [Some Notes on *Dermestes lardarius* and similar Pests.]—*Mitt. Ges. Vorratsschutz*, ii, no. 1, pp. 6–7. Berlin, January 1926.

Brief, popular notes are given on various Dermestids infesting foodstuffs and other stored products in Germany.

MARCHAL (P.). **Sur les conditions de la vie aérienne ou souterraine des Aphides et en particulier de l'***Eriosoma lanuginosum*, **Hartig.**—*C. R. hebdom. Acad. Sci.*, clxxxii, no. 3, pp. 189–191. Paris, 1926.

Erisoma lanuginosum, Hart. (pear root aphis) migrates in summer from elm to the roots of pear, with a partial return in the autumn to elm.

In order to determine how far external conditions influence this Aphid, the author infected pear trees in pots in July and August from galls on elms. Some of the infested trees were left in the open air and merely covered with fine muslin, the others were placed in a breeding-cage in a laboratory with a north light. In the open, the young Aphids came down the plants on hatching and attacked the roots; in the breeding-cage, large colonies of apterous individuals, covered with a woolly secretion, developed during August and September on the aerial part of the plants. By the end of October the whole colony was transformed into winged sexuparae, and, since the subterranean Aphids were entirely lacking, the plants became completely free from Aphids. It appears probable that the uniform coolness maintained by watering the plants in a cage, of which a large part was glass, in a room not exposed to the sun, permits the species to develop on the aerial parts. From this it may be deduced that *E. lanuginosum* is a species that seeks the coolness of the soil, unless there is sufficient cool moisture above the ground, in which case it completes its development there. It is worthy of note that *E. lanigerum*, Hausm. (woolly apple aphis), is less exacting than *E. lanuginosum*, since it can live naturally either on the roots or on the aerial part of the plants, the subterranean or aerial individuals predominating according to climate, soil and meteorological conditions of the year.

FAURE (Jean C.). **Sur la spécificité relative des insectes parasites polyphages.**—*C. R. hebdom. Acad. Sci.*, clxxxii, no. 3, pp. 243–245, 1 ref. Paris, 1926.

From the point of view of any given host its parasites may be divided into two groups, normal and occasional. In the case of *Pieris brassicae*, L., the first group includes *Apanteles glomeratus*, L., *Anilastus ebeninus*, Gr., *Pteromalus puparum*, L., *Pimpla instigator*, F., and *Compsilura concinnata*, Mg., and the second, *Trichogramma evanescens*, Westw., *Apanteles rubripes*, Hal., *Anilastus vulgaris*, Brischke, *Chalcis femorata*, Panz., *Tricholyga segregata*, Rond., *Ceromasia florum*, Macq., *Tachina larvarum*, L., and *Phryxe vulgaris*, Fall. The normal parasites are all more or less polyphagous, but *Apanteles glomeratus* and *Pteromalus puparum* show a greater affinity for *Pieris brassicae* than for any other host. In the case of such parasites there is perfect agreement in their biological and annual cycles with those of their normal host, and generally these parasites alone are sufficient to check the occurrence of abnormal numbers of the pest.

HUBAULT (E.). **Contribution à la biologie du genre *Medeterus* Fischer (Dipt. Dolichopodidae).**—*Ann. Sci. nat., Zool.*, viii, no. 3–6, pp. 133–141, 9 figs., 9 refs. Paris, December 1925.

The morphology of *Medeterus signaticornis*, Lw., and of *M. pallipes*, Zett., is described. The larvae of these flies are found in the galleries of Scolytids infesting coniferous trees in France, though whether they are primary, or merely accidental, predators on the beetles is uncertain.

CHEVALIER (L.). **Le *Psen atratus*, hyménoptère mangeur de larves de Pucerons.**—*Bull. Soc. Sci. Seine-&-Oise*, (2), vi, no. 4, pp. 41–45, 1 ref. Versailles, 1925.

This is an account of the life-history and parasites of the Sphegid wasp, *Psen atratus*, which feeds on Aphids.

HOFMÄNNER (B.). **Beiträge zur Kenntnis der Oekologie und Biologie der schweizerischen Hemipteren (Heteropteren und Homopteren).** [Contribution to the Knowledge of the Ecology and Biology of the Rhynchota of Switzerland.]—*Rev. suisse Zool.*, xxxii, no. 14–20, pp. 181–206, 7 refs. Geneva, October 1925.

The biology and ecology of the Swiss Rhynchota are discussed, and it is stated that few species appear in important numbers. In the sub-alpine and alpine districts, *Deltocephalus abdominalis*, *Phylaenus leucophthalmus*, *Halticus apterus* and *Lygus pratensis* are sometimes numerous. In the lowlands *Eurydema oleraceum* may endanger the colza harvest.

SIMM (K.). ***Phytomyza lateralis* Fallen. Ein Beitrag zur Kenntnis der Morphologie und Biologie.** [Contribution to the Knowledge of the Morphology and Biology of *P. lateralis*.]—*Bull. intern. Acad. pol. Sci. Let.*, Sci. nat., no. 9–10 (1924), pp. 735–752, 2 pls,. 10 refs. Krakow, November–December 1925.

Phytomyza spp. usually feed in the leaves of dicotyledons, but *P. cinereifrons*, Hardy, has been recorded mining in barley, and *P* *lateralis*, Fall., as a pest of wheat, rye and barley. The author found the latter fly in large numbers mining in the leaves of *Lolium italicum* and in rye, in which it was doing considerable damage. The larvae appear in early May. Pupation takes place at the end of the month in the leaf mines, and the adults emerge about 11 days later. There are at least four generations a year, the one in May being the most harmful. The larvae are heavily parasitised by the Braconids, *Dacnusa areolaris*, Nees, and *D. rufipes*, Nees, and by Chalcids of the genus *Pteromalus*.

NEUWEILER (E.). **Beobachtungen über die Drahtwürmer.** [Observations on Wireworms.]—*Landw. Jahrb. Schweiz*, xl, no. 1, pp. 135–142. Bern, 1926.

As a result of 10 years' observations and of experiments at the Swiss Agricultural Institute at Oerlikon it has been found that *Agriotes obscurus*, L., and *A. lineatus*, L., are the wireworms chiefly responsible for injury in Switzerland. Their occurrence is favoured by the practice of keeping land alternately under grass and under cultivation. Both species are present together; at Oerlikon *A. obscurus* was five times as numerous as *A. lineatus*. The adults appear from early March to the end of June, with a maximum abundance in May. They are very numerous after warm rain. Gas liquor proved useless against these pests. While they are attracted by baits, potatoes poisoned with arsenic, lead arsenate paste or strychnine, and a bran bait poisoned with arsenic were unsatisfactory.

SPRENGEL (—). **Eine Schädlingskatastrophe im pfälzischen Weinbau.** (*Clysia ambiguella* **Hübn. Lep.**) [The Outbreak of a Vine Pest in the Rhine Palatinate.]—*Anz. Schädlingsk.*, ii, no. 1, pp. 1–5, 8 figs. Berlin, 15th January 1926.

Owing to the weather being extremely favourable to it in 1925, the vine-moth, *Clysia ambiguella*, Hb., increased enormously in the Rhine Palatinate, especially in the Bavarian districts. The flower-clusters suffered very serious injury, the losses being estimated at about £1,000,000. Nicotine and arsenical sprays were used, and it was proved that if an arsenical spray be applied at the proper time, as ascertained by careful watching in each case and not according to a hard and fast rule, it produces very excellent results.

DECKERT (W.). **Befall einer Tabakpartie mit** *Dermestes vulpinus* **F. (Speckkäfer.)** [The Infestation of a Parcel of Tobacco with *D. vulpinus*.]—*Anz. Schädlingsk.*, ii, no. 1, pp. 8–9. Berlin, 15th January 1926.

Some bales of Brazilian tobacco unloaded at Hamburg in September 1925 were found to be infested with *Dermestes vulpinus*, F. The whole consignment was fumigated with hydrocyanic acid gas at a strength of 2 volumes per cent., and this destroyed all the beetles, even those deep inside the bales. The original infestation must have occurred either in the Brazilian harbour sheds or in the hold of the steamer, which also carried skins, hides, horns and bones.

Ozols (E.). **Zaļā burkānu lapu uts** (*Trioza viridula* **Zett.**).—Lauksaimniecības pārvaldes izdevums, Krājumā pie " Letas," 32 pp., 11 figs. Riga, 1925. (With a Summary in English.)

In some parts of Latvia, carrots were considerably injured by *Trioza viridula*, Zett., in 1919, and by 1922 the attack had increased to such an extent that their cultivation was brought to an end. The adults attack the plants in May. After repeated matings eggs to the number of 420–761 per female are laid at the rate of 21–38 daily. Incubation requires 12–15 days. After the 5th moult the adult emerges. The larvae and nymphs feed on the juices of the stalks and develop in 27–31 days. The leaves are more deformed or curled by the feeding of the adults than by that of the earlier stages. In the field only one generation was observed, though there were two in the laboratory. The adults hibernate, and were observed chiefly attached to the base of fir needles, but some individuals were found under the snow on carrots left in the ground in autumn. The adults can live in summer on the juices of fir needles. Natural enemies include *Coccinella septempunctata*, L., *C. quinquepunctata*, L., *Chrysopa* sp., *Syrphus* sp., and some beetles of the genus *Bembidium*. A parasite, *Tetrastichus* sp., has been found in different parts of the infested area. The cold, damp weather of 1923 appears to have been unfavourable to the Psyllid, and in that year carrots suffered much less. Nicotine, petroleum emulsion and a decoction of quassia have been found to be the best remedies.

Bledowski (R.) & Krainska (M.K.). **Die Entwicklung von** *Banchus femoralis* **Thoms. (Hymenoptera, Ichneumonidae).** [The Development of *B. femoralis*.]—*Bibliotheca Univ. liberae Polonae*, Fasc. 16, 50 pp., 2 figs., 8 pls., 33 refs. Warsaw, 1926.

The Ichneumonid, *Banchus femoralis*, Thoms., oviposits in young caterpillars of the Noctuid, *Panolis flammea*, Schiff. Several eggs may be laid in one caterpillar, but not more than two larvae can develop in one host, which dies if infested by several parasites. The development of the Ichneumonid requires a year like that of its host; 45–50 days pass from oviposition to the time when the larva emerges from its host in order to pupate. The morphology of the larva is described.

Kunhi Kannan (K.). **The Coffee Borer.**—*Planters' Chron.*, xx, no. 51, pp. 922–924. Madras, 19th December 1925.

A brief account is given of the work carried out against the coffee borer [*Xylotrechus quadripes*] by the Entomological Section of the Department of Agriculture, Mysore, since 1915. The first control measure recommended, that of scrubbing the coffee stems [*R.A.E.*, A, vi, 74], has been carried out by some planters with excellent results, but it requires considerable expenditure on labour. The necessity for abandoning the use of a coal-tar derivative wash [*R.A.E.*, A, vii, 288; xi, 34] and the success obtained by hand-picking the beetles have already been noticed [*R.A.E.*, A, xii, 522; xiii, 647]; this last method again gave good results in 1925, and there is reason to believe that hand-picking on a part of an estate causes a reduction in infestation over the whole. It is proposed to carry out experiments with an adhesive wash applied to the stems to capture the beetles, and with the application of dusts to the trees, to kill the young larvae as they penetrate the bark.

Beeson (C. F. C.). *Xyleborus fornicatus* **in India.**—*Trop. Agriculturist,* lxv, no. 6, pp. 371–372. Peradeniya, December 1925.

In reviewing the distribution of *Xyleborus fornicatus*, Eichh. [*R.A.E.*, A, viii, 209], the author has collected a few records of this species from India, including personal observations during 1924 and 1925 in Madras in logs of *Ixora parviflora, Odina wodier* and *Erythrina indica*, and in cut branchlets of *Albizzia odoratissima*; in Mysore in living *Ricinus communis*; and in Bengal in *Gmelina arborea.*

He agrees that *X. fornicatior*, Eggers, cannot be accepted as a good morphological species [*R.A.E.*, A, xi, 257], though on biological evidence the retention of the name as a subspecies is desirable.

Gardner (J. C. M.). **Identification of Immature Stages of Indian Cerambycidae. I. Cerambycini.**—*Ind. Forest Records,* xii, pt. 2, pp. [89]–[105], 3 pls., 7 refs. Calcutta, 1925.

This is the first of a series of papers dealing with various groups of Cerambycids, to facilitate the identification of the immature stages. The species dealt with are all of considerable importance, *Hoploccerambyx spinicornis,* Newm., in particular causing serious losses. The classification of the subfamily Cerambycinae is explained, and the characters common to all the species described in this paper, and which will serve to distinguish the whole tribe Cerambycini from other tribes in the subfamily, are given. A key is given to the adults of *Dialeges pauper,* Pasc., *H. spinicornis, Plocaederus obesus,* Gah., *Aeolesthes holosericea,* F., and *Diorthus cinereus,* F., the immature stages of which are described. They are all borers in *Shorea robusta.*

Mahdihassan (S.). **Some Insects associated with Lac and a symbolic Representation of their Interrelationship.**—*Jl. Sci. Assoc., Maharajah's Coll., Vizianagaram,* ii, no. 2–3, pp. 64–87. Madras, October 1925. [Recd. January 1926.]

Of the species dealt with, the internal parasites of lac insects, all of which are Chalcids, include *Erencyrtus dewitzi* Mahd., *Microterys hautfeuilli,* sp. n., *Lissencyrtus troupii,* Cam., *L. somervilli,* sp. n., and *Copidosoma clavicornis,* Cam. (which may be a hyperparasite). Predacious caterpillars include *Eublemma amabilis, E. scitula, E. coccidiphaga, Holcocera pulverea, Strathmopoda theoris, Anatrachyntis falcatella,* and *Oedematopoda venusta.* Enemies of *Eublemma amabilis* are *Brasema annulicaudis,* Cam., *Bracon tachardiae,* Cam., *Elasmus colemani,* Mahd., and an unidentified carnivorous beetle. Parasites attacking *E. scitula* and *E. coccidiphaga* include a species of *Trichogramma* and *Aphrastobracon flavipennis,* How. Parasites of *H. pulverea* include *Chalcis tachardiae,* Cam., *Eurytoma pallidiscapus,* Cam., *Apanteles tachardiae,* Cam., and *A. fakhrulhajiae,* sp. n., a species of *Chelonus* and two Ichneumonids. The author has constructed a diagram showing the interrelationship among lac associates.

Sreenivasaya (M.). **Advances in the Experimental Technique of Lac Culture.**—*Jl. Sci. Assoc., Maharajah's Coll., Vizianagaram,* ii, no. 2–3, pp. 89–90. Madras, October 1925. [Recd. January 1926.]

The development of technique is a pressing need in lac culture, and this paper records a few of the advances that have been made in this direction.

George (C. J.). **Root-sucking Aphids of Coimbatore.**—*Jl. & Proc. Asiat. Soc. Bengal, Biol. & Phys. Sci.,* N.S., xx (1924), no. 6, pp. 307–311, 1 pl. Calcutta, November 1925.

The root-infesting Aphids recorded are *Tetraneura ulmi,* DeG., which breeds parthenogetically throughout the year, and of which the recorded food-plants are *Eleusine coracana, Sorghum, Panicum colonum, P. javanicum, P. miliaceum, Setaria italica* and rice (*Oryza sativa*) ; another species of *Tetraneura,* which attacks sugar-cane roots ; *Geoica* sp., which feeds on the roots of *Sorghum,* and occurs from November to January, but not in large numbers ; *Forda* sp., found only in the black cotton soils on the roots of *Sorghum* ; and *Aphis* (*Rhopalosiphum*) *avenae,* F., which is normally a shoot-infesting species, but occasionally occurs on roots, feeding on *Eleusine coracana* and *Panicum colonum.*

The young of the species of *Forda* are born enclosed in a thin transparent membrane, which soon breaks and liberates the insects. They have four moults, extending over a period of about 8 days from hatching.

The only enemy noted so far of these Aphids, all of which, except *A. avenae,* are new to India, is the larva of a Syrphid fly.

Ettling (C.). **Die Rosella-Pflanze** (*Hibiscus sabdariffa*), **ihr Anbau und ihre Verwertung.** [*H. sabdariffa,* its Cultivation and Utilisation.]—*Der Tropenpflanzer,* xxix, no. 1, pp. 2–23, 3 figs. Berlin, January 1926.

Hibiscus sabdariffa (roselle) is being grown in the Dutch East Indies, the jute-like fibre obtained from its bark being suitable for making bags. A bug, *Dysdercus cingulatus,* injures the seeds and should be systematically collected.

Leefmans (S.). **Schadelijke insecten in importartikelen in blik.** [Injurious Insects in imported Goods packed in Tin.]—*De indische Culturen,* x, no. 24, pp. 736–739, 3 figs. Soerabaya, 15th December 1925.

Food-stuffs imported into the Dutch East Indies in cases with a soldered tin lining have been found to be infested by various insects. Chocolate, wrapped in paper or tinfoil and shipped in such cases, has been infested by the larvae of *Ephestia cautella,* Wlk., a description of the various stages of which is given. Foods packed in well closed tins have harboured Psocids and a beetle, *Tribolium castaneum,* Hbst. (*ferrugineum,* F.) ; and cigars and cigarettes from Europe have been infested by the tobacco beetle, *Lasioderma* [*serricorne,* F.].

GANDRUP (J.). **Over aaltjes en achterlijke tabaksbibit.** [On Nematodes and backward Tobacco Seedlings.]—*Meded. Besoekisch Proefst.*, no. 39, pp. 10–14, 2 pls. Djember, 1925.

Slow growth of tobacco seedlings has been traced to infestation by Nematodes, and may be avoided by treating the soil with heat or carbon bisulphide. In the former method 7 cu. ft. of soil is removed from the surface of the bed having an area of 100 sq. ft. This earth is placed on a sheet of iron covering a trench, in which a fire is burning, until it reaches a temperature of 70° C. [158° F.]. The earth is then spread again on the bed and sowing is done the next day. A less primitive method is fumigation with carbon bisulphide at the rate of 1 fl. oz. per 10 square feet of earth, which has to be treated to a depth of 6 inches. Pieces of bamboo about 8 inches long are placed in the ground, and some bisulphide is poured in ; the bamboo is then quickly removed, and the hole closed with earth.

FEY (K. Y.). *Hispa armigera*, **a Rice Leaf Beetle and its Control.** (*In Chinese.*)—*Bur. Ent. Chekiang*, Pop. Bull. 14, 9 pp., 3 figs. Kashing, China, August 1925. [Recd. February 1926.]

In April 1925 *Hispa armigera*, Ol., was very abundant in Wenchow, the south-eastern district of Chekiang, and by the end of July had increased to such an extent that the rice leaves withered away. The loss sustained is estimated at about 40–50 per cent. of the whole crop. The characteristics of the beetle are given and such remedial measures as collecting by hand nets, and removal of weeds and of infested leaves are also dealt with.

YAGO (M.) & NOGUCHI (T.). **Studies on the Pear Borer,** *Laspeyresia molesta*, **Busck. 2nd Report.** (*In Japanese.*)—*Shizuoka Agric. Expt. Sta.*, March 1925. [Recd. February 1926.]

Cydia (*Laspeyresia*) *molesta*, Busck, is widely distributed in Japan and does serious damage to pears. There may be 4 or 5 generations a year. In summer the eggs hatch in 3–4 days, the larvae spin cocoons 8–17 days after hatching, and the pupal stage lasts 5–8 days. The adults usually emerge in the morning, and the females slightly outnumber the males. They fly only a short distance, particularly the females, and live 4–14 days. A species of thrips attacks the eggs.

KUWANA (I.). **The Diaspine Coccidae of Japan. iii. The Genus** *Fiorinia.*—*Dept. Finance, Japan, Imp. Plant Quar. Serv.*, Tech. Bull. 3, pp. 1–20, 7 pls. Yokohama, December 1925.

The species dealt with are *Fiorinia fioriniae*, Targ., which is one of the most destructive greenhouse pests, but is probably not a serious one under outdoor conditions ; *F. japonica*, Kuw., originally described on *Podocarpus* and pine from Japan and probably native to that country ; *F. juniperi*, Leon., which has formerly been confused in Japan with *F. japonica* ; *F. theae*, Green, found on the lower surface of leaves of *Eurya japonica*, and originally described on tea plants from India ; *F. euryae*, sp. n., closely allied to the above and found in the same habitat ; *F. vacciniae*, sp. n., on the lower surface of leaves of *Vaccinium bracteatum*; *F. tenuis*, Mask., on bamboo; and *F. signata*, Mask., on *Bambusa tessellata*. Descriptions are given of all of these species with particulars of their food-plants and distribution.

ISHII (T.). **New Encyrtinae from Japan.**—*Dept. Finance, Japan, Imp. Plant Quar. Serv.*, Tech. Bull. 3, pp. 21-30, 1 pl. Yokohama, December 1925.

The new Hymenopterous parasites described from Japan include *Pareusemion* (gen. n.) *studiosum*, from *Coccus* (*Lecanium*) *hesperidum*, L., on *Citrus*; *Comperiella unifasciata*, from *Pseudaonidia duplex*, Ckll.; *Cerapterocerus fortunatus*, from *Aleurodaphis* sp. on *Quercus glauca*, probably a hyperparasite; and *Anisotylus albifrons*, from larvae of *Scymnus* sp.

YOKOYAMA (K.). **Studies on the Japanese Dermestidae, I.** (*In Japanese.*)—*Imp. Seric. Expt. Sta.*, Rept. 7, no. 2, pp. 65–118, 3 pls. Tokyo, October 1925.

Several species of Dermestids are injurious to the silk and cocoons of *Bombyx mori*, L., in Japan. *Dermestes coarctatus*, Hld., is dealt with in this report. There are two generations a year, the adults of the first brood emerging about the end of July, and those of the second in September. The latter hibernate and begin to be active in April. They occur in dark places, feeding on various animal substances, and live about one year. The eggs are laid on the cocoons and also in the crevices of the store-houses. There is a long egg-laying period, from 70–120 days, with an average of 88 days, and one female can deposit an average of 5·6 eggs in one day, with an average of 250 in all. The egg period varies with the temperature (2–7 days). The larva usually moults 6 times, sometimes 7 or 8. This period varies from 30–60 days according to the temperature. The pupal stage lasts 7–8 days. No natural enemies have been observed.

YOKOYAMA (K.). **Resistance to Heat in** *Dermestes coarctatus*, **H., and** *Tribolium ferrugineum*, **Fab.** (*In Japanese.*)—*Imp. Seric. Expt. Sta.*, Rept. 7, no. 2, pp. 119–167. Tokyo, October 1925.

Temperatures of 56–58° C. [132·8–136·4° F.] are fatal to the adults of *Dermestes coarctatus*, Hld. The females are more resistant than the males, and both are more so than the pupae, while the larvae are the most resistant of all. *Tribolium castaneum*, Hbst. (*ferrugineum*, F.) is even more resistant to heat than *D. coarctatus*.

YOKOYAMA (K.). **A List of Insects injurious to the Mulberry Tree and the Silkworm.** (*In Japanese.*)—*Sangyôsikenzyô Ihô*, no. 19, January 1923. (Abstract in *Jap. Jl. Zool.*, i, no. 3, p. (99). Tokyo, July 1925.) [Recd. February 1926.]

The insects recorded include 115 species from Formosa and 97 from Japan injurious to the mulberry tree, and from Japan also 9 species attacking silkworm larvae and 20 attacking the cocoon.

YANO (Y.). **Preventive Measures against the Spread of** *Chilo simplex,* **Butler.** (*In Japanese.*)—*Konchû Sek.* [*Insect World*], xxvi, no. 1, pp. 11–14, 1 fig. Gifu, 1922. (Abstract in *Jap. Jl. Zool.,* i, no. 3, p. (104). Tokyo, July 1925.) [Recd. February 1926.]

Recommendations are made for the proper management of rice straw to prevent the increase of *Chilo simplex,* Butl., and other pests.

NAWA (U.). **On Some Noxious Insects of Cherry-trees.** (*In Japanese.*) —*Konchû Sek.* [*Insect World*], xxvi, no. 5, pp. 148–153, 1 pl. Gifu, 1922. (Abstract in *Jap. Jl. Zool.,* i, no. 3, p. (105). Tokyo, July 1925.) [Recd. February 1926.]

The insects recorded as infesting cherries are : *Leucotermes speratus,* Kolb. ; *Aulacaspis* (*Diaspis*) *pentagona,* Targ., *Aspidiotus perniciosus,* Comst., *Myzus* (*Rhopalosiphum*) *persicae,* Sulz., and *Aphis pomi,* DeG. (*mali,* L.) ; *Tettigoniella* (*Tettigonia*) *viridis,* L. ; *Stephanitis ambigua,* Horv. ; *Oberea japonica,* Thunb., *Adoretus umbrosus,* F., *Popillia japonica,* Newm., *Anomala rufocuprea,* Motsch., *A. geniculata,* Hope, and *Mimela lucida,* Motsch. ; and *Zeuzera pyrina,* L., *Aegeria hector,* Butl., *Clania minuscula,* Butl., *Cnidocampa flavescens,* Wlk., *Parasa sinica,* Moore, *Elcysma westwoodi,* Voll., *Spilarctia imparilis,* Butl., *Cistidia couaggaria,* Guen., *Rhodinia fugax,* Butl., *Malacosoma neustria* var. *testacea,* Motsch., *Euproctis flava,* Brem., *Porthesia xanthocampa,* Dyar, *Porthetria* (*Lymantria*) *dispar* var. *japonica,* Mats., *Phalera flavescens,* B. & G., and *Marumba gaschkewitschii,* B. & G.

TOMIZAWA (K.). **Noxious Insects of Mulberry-trees in the Region of Iga.** (*In Japanese.*)—*Konchû Sek.* [*Insect World*], xxvi, no. 10, pp. 335–340, Gifu, 1922. (Abstract in *Jap. Jl. Zool.,* i, no. 3, p. (106). Tokyo, July 1925.) [Recd. February 1926.]

The mulberry pests recorded are : *Holochlora brevifissa,* Brunn., *Aulacaspis* (*Diaspis*) *pentagona,* Targ., *Takahashia japonica,* Ckll., *Ceroplastes ceriferus,* And., *Anomoneura mori,* Schw., *Ricania japonica,* Melich., *Geisha distinctissima,* Wlk., *Dictyophora sinica,* Wlk., *Exartema morivora,* Mats., *Tortrix* (*Archips*) *crataegana,* Hb., *T.* (*A.*) *asiatica,* Wlk., *Glyphodes pyloalis,* Wlk., *Diacrisia lubricipeda,* L., *Spilarctia* (*D.*) *imparilis,* Butl., *Hemerophila atrilineata,* Butl., *Zamacra albofasciaria,* Leech, *Boarmia selenaria,* Hb., *Acronycta rumicis,* L., *Bombyx mandarina,* Moore, *Arctornis chrysorrhoea,* L. (*Porthesia similis,* Fuess.), *Diplosis* sp., *Xyleborus morivorella* Niishima, *Apriona rugicollis,* Chevr., *Xylotrechus chinensis,* Chevr., and *Luperus impressicollis,* Motsch.

TAKEDA (N.). **Addition to the Noxious Insects of Mulberry-trees in the Region of Iga.** (*In Japanese.*)—*Konchû Sek.* [*Insect World*], xxvii, no. 4, pp. 119–122. Gifu, 1923. (Abstract in *Jap. Jl. Zool.,* i, no. 3, p. (107). Tokyo, July 1925.) [Recd. February 1926.]

This list is supplementary to the preceding paper, and includes some additional minor pests.

MUKAIKAWA (Y.). **Some Insects Noxious to the Bamboo.** (*In Japanese.*)—*Konchû Sek.* [*Insect World*], xxvii, nos. 2–4, pp. 50–53, 92–94 & 126–127, Gifu, 1923. (Abstract in *Jap. Jl. Zool.*, i, no. 3, p. 107). Tokyo, July 1925.) [Recd. February 1926.]

The species recorded as infesting bamboo are: TERMITIDAE: *Leucotermes speratus*, Kolb., and *Odontotermes formosanus*, Shiraki; COCCIDAE: *Odonaspis* (*Aspidiotus*) *inusitatus*, Green, *O.* (*A.*) *secretus*, Ckll., *O.* (*A.*) *bambusarum*, Ckll., *Leucaspis bambusae*, Kuw., *Chionaspis bambusae*, Ckll., *C. hikosanii*, Kuw., *C. colemani*, Kuw., *Aclerda tokionis*, Ckll., *Asterolecanium bambusae*, Boisd., *Eriococcus onukii*, Kuw., *Phenacoccus takae*, Kuw., and *Antonina crawi*, Ckll.; APHIDAE: *Myzocallis arundicolens*, Clarke (*Takecallis bambusae*, Mats.), *M. sasae*, Mats., *Yezabura sasae*, Mats., and *Oregma bambusae*, Buckt.; FULGORIDAE: *Eurysa nawae*, Mats.; JASSIDAE: *Thamnotettix bambusae*, Mats.; COREIDAE: *Notobitus meleagris*, F.; GRYLLIDAE: *Brachytrypus achatinus*, Stål; PYRALIDAE: *Pyrausta colesalis*, Wlk.; ZYGAENIDAE: *Artona* (*Ino*) *funeralis*, Butl.; NOCTUIDAE: *Polydesma vulgaris*, Butl.; LASIOCAMPIDAE: *Cosmotriche potatoria*, L., *C. albomaculata*, Brem., and *C. laeta*, Wlk.; HESPERIIDAE: *Parnara guttata*, Brem., and *P. pellucida*, Murr.; SATYRIDAE: *Melanitis leda*, L., and *Mycalesis gotama*, Moore; TRYPETINAE: *Acroceratitis plumosa*, Hep.; CECIDOMYIIDAE: *Cecidomyia* sp.; CERAMBYCIDAE: *Purpuricenus temminckii*, Guér., *Clytanthus annularis*, F., *Caloclytus latifasciatus*, Fisch., and *Aelara furcata*, Bates; CURCULIONIDAE: *Cyrtotrachelus longipes*, F.; BOSTRYCHIDAE: *Dinoderus japonicus*, Lesne; LYCTIDAE: *Lyctus* (*Xylotrogus*) *brunneus*, Steph., and *Lyctoxylon japonicum*, Reit.; ANOBIIDAE: *Oligomerus brunneus*, Oliv., *Nicobium hirtum*, F., and *Ernobius abietis*, F.; ELATERIDAE: *Melanotus legatus*, Cand.; APIDAE: *Xylocopa circumvolans*, Smith; and CHALCIDAE: *Isosomocharis* sp.

YANAGIHARA (M.). **On** *Hellula undalis* **Fabricius injurious to the Garden Radish.** (*In Japanese.*)—*Konchû Sek.* [*Insect World*], xxvii, no. 5, pp. 147–151, 1 pl. Gifu, 1923. (Abstract in *Jap. Jl. Zool.*, i, no. 3, p. (108). Tokyo, July 1925.) [Recd. February 1926.]

The external characters of *Hellula undalis*, F., are described with notes on its habits and control.

MURATA (J.). **On** *Anthonomus pomorum*, **L., injurious to the Pear Blossom.** (*In Japanese.*)—*Konchû Sek.* [*Insect World*], xxvii, no. 6, pp. 187–190. Gifu, 1923. (Abstract in *Jap. Jl. Zool.*, i, no. 3, p. (108). Tokyo, July 1925.) [Recd. February 1926.]

The life-history and control of *Anthonomus pomorum*, L., on pears are discussed.

KISHIDA (K.). **On the Systematic Position of** *Nephrophages sanguinarius* **Miyake et Scriba, with a Note on the Scientific Name of a Mite found in Wheat Grain.** (*In Japanese.*)—*Dobuts. Zasshi* [*Zool. Mag.*], xxxv, no. 415, pp. 203–208, 2 figs. Tokyo, 1923. (Abstract in *Jap. Jl. Zool.*, i, no. 3, p. (112). Tokyo, July 1925.) [Recd. February 1926.]

Tarsonemus hordei, sp. n., is described from (? stored) wheat.

MENZEL (R.). **Mermithiden als parasieten van** *Helopeltis.*

STEINER (G.). **Mermithids parasitic in the Tea Bug** (*Helopeltis antonii*, **Sign.).**—*Meded. Proefst. Thee,* xciv, pp. 3–16, 5 pls., 19 refs. Buitenzorg, 1925.

Two Mermithids, *Hexamermis microamphidis*, sp. n., and *Agamermis paradecaudata*, sp. n., infesting *Helopeltis antonii*, Sign., in Java, are described. Their effect on the numbers of the pest is, however, unimportant.

PETERSON (A.). **Oriental Peach Moth in the Season of 1923** —*Rept. New Jersey Agric. Expt. Sta., 1923–24,* pp. 291–294. New Brunswick, N.J., 1925.

A large number of orchards became infested with *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental peach moth) for the first time in 1923 [*cf. R.A.E.*, A, xiii, 384], and in some of them as much as 90 per cent. of the fruit was damaged. The early varieties are thought to have suffered serious injury because the larvae of the second and subsequent broods attacked the fruit instead of the twigs on account of the growth of the latter having been arrested by drought. The failure of odour-producing chemicals to attract the adults, and the value of sweetened yeast baits for this purpose have already been noticed [*R.A.E.*, A, xiii, 252]. An attractive bait for the adults is of value in indicating the time of oviposition, but is not likely to prove a practical means of control. Spraying with 40 per cent. nicotine sulphate to destroy the eggs of the second and later broods gave no material reduction in infestation of the fruit. It was noticed that infestation of fruit is sometimes not recognisable from the outside, as some of the larvae enter by the green stems.

PETERSON (A.). **Further Observations on the Pepper Maggot** (*Spilographa electa* **Say) during 1923.**—*Rept. New Jersey Agric. Expt. Sta., 1923–24,* pp. 295–298. New Brunswick, N.J., 1925.

During 1923 *Spilographa electa*, Say (pepper maggot) [*R.A.E.*, A, xii, 47] again proved a serious pest of some varieties of peppers [*Capsicum*] in parts of New Jersey, infestation amounting to from 50 to 90 per cent. No injury to egg-plants [*Solanum melongena*] was observed. Of several hundred puparia kept in soil in the open through the winter, 80 per cent. produced adults, of which approximately two-thirds were males ; the same proportion of the sexes was observed among insects captured in the field. The first adults were observed in the field on 27th June, and the last on 4th September, the maximum number occurring at the end of July and the beginning of August. Under natural conditions the females make many more egg-punctures in the fruit than they lay eggs. The average number of punctures in each of 107 pepper fruits was 3·8, but of these only 15 per cent. contained eggs. Various substances were used as baits in traps, but no adults were caught in them. Spraying experiments with lead arsenate failed to give any satisfactory results, owing to the rapid mortality of the flies introduced to infest the plants ; in one case adults lived for a week in a cage placed over an unsprayed plant, while others of the same lot placed in a cage over a sprayed plant died in two days, thus indicating that lead arsenate is perhaps toxic to the adults.

HEADLEE (T. J.). **Report of the Department of Entomology.**—*Rept. New Jersey Agric. Expt. Sta., 1923–24*, pp. 279–349, 1 fig., 8 refs. New Brunswick, N.J., 1925.

Following the discovery that the efficiency of colloidal clay in preventing the larva of the bean Bruchid [*Bruchus obtectus*, Say] from penetrating into the bean seed is correlated with the fineness of the particles of the dust [*R.A.E.*, A, xiii, 260], extensive experiments were made to determine the optimum size for the particles. As a result of these experiments it is shown that the most efficient dust is Milltown ball clay no. 9 of a fineness that will pass through a sieve with 100 meshes to the inch.

The results of experiments in spraying with lead arsenate for the control of the codling moth [*Cydia pomonella*, L.] obtained in 1921–23 [*loc. cit.*] are discussed. In New Jersey the second and third sprays, applied at the time that the larvae of the first and second broods are entering the young fruit, are of much greater importance than the first, applied at the fall of the petals. The conclusions reached with regard to the importance of the amount of lead arsenate applied per tree per treatment, and of the continuity of the arsenical coating, have already been noticed in conjunction with further experiments [*R.A.E.*, A, xiii, 255]. Tests of a commercial brand of apparently true colloidal sulphur showed that in combination with lead arsenate this substance did not produce any increase in the water-soluble arsenic available, while a considerable increase resulted from its combination with lime and lead arsenate. B. F. Driggers has determined that certain organic colloidal material, particularly such as occurs in cranberry bog soil and water, has the property of removing water-soluble arsenic from solution and rendering it insoluble. It therefore seems possible that an inorganic colloid, such as the above-mentioned sulphur, might have the same property, and consequently might, when mixed with lead hydrogen arsenate, actually reduce the amount of water-soluble arsenic in the original product. It may, therefore, be found that the use of colloidal sulphur alone in the place of the dry mixture of hydrated lime and fine sulphur [*R.A.E.*, A, xii, 48] in combination with lead arsenate, as an insecticidal and fungicidal spray, will eliminate the spray injury that sometimes results from the latter combination; reports received from fruit growers support this view.

F. L. Campbell has studied the chemistry of lead hydrogen arsenate and lime, when applied as a spray to foliage; his conclusions are as follows: Acid lead arsenate reacts slowly with calcium hydroxide (hydrated lime) to form tri-lead arsenate and tri-calcium arsenate and water. Arsenical injury to foliage by acid lead arsenate sprays and by acid lead arsenate and lime sprays seems to be made possible by the action of a leaf-water film on the dried spray deposit. The leaf-water film appears when temperature and relative humidity are high enough. Arsenic in the leaf-water film is less injurious to foliage in the form of calcium arsenate than it is in the form of arsenic acid; hence a combination spray of lime and acid lead arsenate, which throws a trace of calcium arsenate into solution, would be expected to be safer for use than an acid lead arsenate spray alone, which throws a trace of arsenic acid into solution. But concentration of the AsO_4 ion may become high enough in the leaf-water film in the combination spray deposit to cause serious injury, if the excess calcium hydroxide is completely converted to calcium carbonate and humid weather conditions prevail.

Detailed descriptions are given of extensive experiments in treating soil with carbon bisulphide and with calcium cyanide for the control of wireworms, probably *Melanotus* spp., which have caused serious damage to market garden crops in New Jersey in recent years. In these experiments the effect on the wireworms of the gases evolved was ascertained by enclosing them in screen-wire cylinders two-thirds filled with moist soil and stoppered at each end. By this means the wireworms could be placed at any desired position or depth. Carbon bisulphide emulsion [*R.A.E.*, A, xiii, 382] was found to be considerably more efficient than raw carbon bisulphide. In cold-frames containing lettuces carbon bisulphide emulsion, at the rate of between ½ and 1 fl. oz. in 1–2 U.S. quarts of water per square foot, watered in with 3 U.S. gals of water, killed 100 per cent. of the wireworms to a depth of 12 inches, without appreciably checking the growth of the lettuces ; the soil temperatures during these experiments varied from about 38° to 45° F.

Satisfactory control of wireworms was obtained by similar applications of carbon bisulphide on plough land, using less water, as the soil was already wet ; the emulsion was applied at the time of ploughing, in the furrow ahead of the plough, and was thus immediately covered. Beets planted in ground thus treated, after an interval of only three days, were seriously checked in growth, but those planted after a somewhat longer interval were uninjured and remained almost free from wireworm damage, while in untreated ground about 50 per cent. of the crop was destroyed by wireworms. Cabbages were treated by applying carbon bisulphide emulsion with water in furrows on each side of the rows ; 1 fl. oz. of emulsion per linear foot in each furrow was needed to control the wireworms, but seriously checked the growth of the cabbages.

A series of experiments somewhat similar to the above was carried out with calcium cyanide in flake form. When calcium cyanide was applied in a cold-frame containing lettuces, the flakes being sifted into furrows 1 inch deep and 6 inches apart and covered with soil, ¼ oz. per square foot killed wireworms, provided that the ground was watered immediately afterwards, but all the plants were killed whether water was applied or not. Calcium cyanide at the rate of 0·1 oz. per square foot killed wireworms within 3 ins. in a lateral direction and 12 ins. in a vertical direction in open ground ; applied at the same rate at the time of ploughing calcium cyanide did not control the wireworms, but killed most of the beets planted a few days later. When applied to cabbages in the same way as carbon bisulphide, 1 oz. of calcium cyanide per linear foot was necessary to control wireworms, but 0·2 oz. killed most of the plants. In all the last three experiments the soil was very moist. The author considers that carbon bisulphide can be used satisfactorily as a control for wireworms when applied about a week before the ground is planted, and that calcium cyanide can probably be used safely if a longer time elapses before planting. In cold-frames the temperature should be about 50° F. or over, and the soil should be well cultivated. In plough land the treatment should be made at the time of ploughing or very soon after.

BECKWITH (C. S.). **Report of the Cranberry Substation.**—*Rept. New Jersey Agric. Expt. Sta., 1923–24*, pp. 300–305. New Brunswick, N.J., 1925.

In 1922, flooding experiments for the control of *Crambus hortuellus*, Hb. (cranberry girdler) were followed in some cases by serious damage by the fungus, *Guignardia vaccinii* (cranberry rot). In 1923, bogs that were flooded in August were sprayed with Bordeaux mixture, 4–4–50, at the rate of 250 U.S. gals. per acre, just before and just after flooding, and bore crops relatively free from rot damage. August flooding is not recommended generally, but when it is necessary, owing to lack of water in September or some other cause, it is a valuable aid in controlling *C. hortuellus*. It has been found that cranberries are pollinated in New Jersey almost entirely by bumble-bees [mostly *Bombus impatiens*, Harr.], and that these insects are present at the rate of about 320 per acre, each one visiting, on the average, 14 flowers a minute. This number is sufficient for the production of a good crop of fruit.

HUTSON (R.). **Bee Investigations.**—*Rept. New Jersey Agric. Expt. Sta., 1923–24,* pp. 325–349, 1 fig., 6 refs. New Brunswick, N.J., 1925.

Investigations showing the importance of honey-bees in the pollination of self-sterile apples are described ; the coincidence of unfavourable weather with the blossoming of the apples resulted in an almost total failure of the crops in the orchards studied, owing to the inactivity of the bees The pollination of cranberries was also investigated [see preceding paper]. In two cases of "disappearing disease" of hive bees the dead bees examined were found to contain sufficient arsenic (over 0·0002 mg. per bee) to cause death. In one case the diseased bees were noticed two days after the application of a petal fall spray to apple trees $\frac{3}{8}$ mile away. Arsenic was not present in honey from the hive in either case. Bees fed on syrup containing arsenic trioxide built combs without being affected. Work in breeding bees resistant to European foul-brood is described.

GOWDEY (C. C.). **Report of Government Entomologist.**—*Jamaica : Ann. Rept. Dept. Sci. & Agric. 1924,* pp. 17–20. Kingston, 1925.

Damage to bananas by *Cosmopolites sordidus*, Germ. (banana borer) has decreased very considerably, in spite of the drought from which the plantations suffered ; the improvement is due to the adoption of trapping and the destruction of old corms as control measures. The Aphid, *Pentalonia nigronervosa*, Coq., occurred frequently on young leaves and shoots of banana.

The sugar-cane pests recorded are *Trionymus* (*Pseudococcus*) *sacchari*, Ckll. ; the Aphids, *Aphis sacchari*, Zehnt., and *Sipha flava*, Forbes ; *Diatraea saccharalis*, F. (sugar-cane moth-borer), the eggs of which were heavily parasitised by the Chalcid, *Trichogramma* (*Pentarthrum*) *minutum*, Riley ; *Stenocranus* (*Saccharosydne*) *saccharivorus*, Westw. (West Indian cane-fly), which was very abundant, but was attacked by the egg-parasite, *Anagrus armatus*, Ashm., and the Reduviid, *Zelus rubidus*, Lep. & Serv. ; and *Laphygma frugiperda*, S. & A., *Remigia* (*Mocis*) *punctularis*, Hb., and *Hyblaea puera*, Cram. (palm caterpillar). In association with the last three species, which also damaged Guinea grass [*Panicum maximum*], a number of parasites were found late in the year, *viz.*, the Tachinids, *Frontina aletiae*, Riley, and *Archytas piliventris*, Wulp, and the Chalcids, *Chalcis robusta*, Cress., and *Spilochalcis femorata*, F.

A widespread attack of the scale, *Froggattiella* (*Odonaspis*) *pimentae*, Newst., and of the Aleurodid, *Aleurodicus pimentae*, Laing (MS.), occurred on pimento in one district. *Strategus titanus*, F. (sugar-cane rhinoceros beetle) and the Scolytid, *Xyleborus perforans*, Woll., infested coconut. Coffee was damaged by *Saissetia hemisphaerica*, Targ. and *Apate* (*Amphicerus*) *terebrans*, Pall. *Heliothis* (*Chloridea*) *obsoleta*, F., and the leafhopper, *Peregrinus maidis*, Ashm., were common on maize, the latter being of importance as a possible vector of sugar-cane mosaic.

The pests of *Citrus* included *Dinaspis annae*, Mal., previously only recorded from Java and Barbados; *Heliothrips haemorrhoidalis*, Bch., on orange and pomelo [*Citrus decumana*]; and *Nasutitermes pilifrons*, Holmgr., reported to be damaging living pomelo trees. *Aleurodothrips fasciapennis*, Frankl., appears to be predacious on *Aleurocanthus woglumi*, Ashby (citrus black-fly) and *Lepidosaphes beckii*, Newm. *L. beckii* and *Hemichionaspis minor*, Mask., continue the most serious pests of *Citrus*; they are very resistant to sprays. Soursop [*Anona muricata*] was attacked by *Aspidiotus lataniae*, Sign., and by *Pseudococcus nipae*, Mask. (coconut mealy-bug). *P. comstocki*, Kuw., which is new to Jamaica, was found on guava [*Psidium guayava*]. Mangos were damaged by a tree-hopper, *Pamula* sp., attacking the fruit stalks and causing the young fruit to drop, and by *Anastrepha fraterculus*, Wied. (mango fruit-fly), which was less prevalent than in 1921–23, and was parasitised in the larval stage by *Opius* (*Utetes*) *anastrephae*, Vier. *Erinnys elope*, Dru., occurred on papaya [*Carica papaya*].

Vegetable pests included *Aphis gossypii*, Glov., and the butterflies, *Pieris* (*Pontia*) *monuste*, L., and *P. monuste* var. *phileta*, F., on cabbage; *Aspidiotus harti*, Ckll., and *Pseudococcus citri*, Risso (citrus mealy-bug) on yams; *Cylas formicarius elegantulus*, Summ., and the Coreid, *Spartocera batatas*, F., damaging sweet potatoes; the Coreid, *Anasa scorbutica*, F., on cucumber; and *Saissetia hemisphaerica*, *Pseudaonidia subtesserata*, Green & Laing, *Corythuca gossypii*, F., *Nezara marginata*, P. de B., and *Oncideres amputator*, F., on Congo pea [*Cajanus indicus*]. Both sexes of *O. amputator* feed on the tender bark and wood; the main stem and larger branches are girdled by the female, which cuts through the bark and partly through the wood, gradually encircling the branch, so that it snaps off very readily. The eggs are laid either during or after the girdling process, in the part of the branch isolated by it; they are inserted singly below the bark or just in the wood, near a bud or shoot, the place of insertion being sealed with a gummy substance. The eggs hatch in about 18 days; the larvae tunnel in the wood, making a few circular holes in the bark for the expulsion of excrement, and after feeding for about 3 months, close the ends of their galleries with frass, forming a chamber in which they pupate. The adult beetle emerges through a circular hole gnawed in the bark. As a control measure all the severed branches, containing eggs, larvae, or pupae, should be collected and destroyed.

Pests of ornamental trees and shrubs were the Noctuid, *Lyncestis acontioides*, Guen., on *Poinciana*; the Hesperiid, *Eudamus proteus*, L., on *Canna*; *Corythuca gossypii* on *Hibiscus*; *Aspidiotus herculeanus*, Doane & Hadden, new to Jamaica, and *Asterolecanium pustulans*, Ckll. (akee fringed scale) on *Cassia*; *Eurypepla jamaicensis*, L., on *Cordia*; *Aulacaspis pentagona*, Targ., on oleander [*Nerium oleander*]; the flea-beetle, *Metachroma rosae*, Bry., on *Agave* and roses; and *Selenaspidus articulatus*, Morg., and *Chrysomphalus aonidum*, L., on roses.

In experiments with insects as vectors of sugar-cane mosaic the infection was transmitted from diseased maize to sugar-cane by means of *Aphis maidis*, Fitch ; only negative results have been obtained with other insects [*R.A.E.*, A, xii, 443], but the author believes that some of them will prove vectors, as *A. maidis* has not yet been observed on sugar-cane in the field.

A list of Hymenopterous parasites bred during the year is given, of which the following have not been mentioned above : *Apanteles prenides*, Mues., from *Prenes nero*, F. ; *A. leucostigmus*, Ashm., from *Eudamus proteus* ; *A. americanus*, Lep., from *Protoparce sexta jamaicencis*, Br. ; *A. congregatus*, Say, from *Deilephila* (*Celerio*) *lineata*, Ochs. ; *Chelonus insularis*, Cress., from *Laphygma frugiperda* ; *Evania appendigaster*, L., and *Tetrastichus periplanetae*, Crawf., from *Periplaneta americana*, L. ; *Arrhenophagus chionaspidis*, Auriv., from *Saissetia nigra*, Nietn. ; *Aplastomorpha calandrae*, How., from *Calandra oryzae*, L. ; *Zagrammosoma multilineata*, Ashm., from *Leucoptera coffeella*, Staint. ; and *Lecanobius cockerelli*, Ashm., from *Saissetia hemisphaerica* and *Pseudoparlatoria ostreata*, Ckll.

WATSON (J. R.). **Camphor Thrips in Formosa.**—*Florida Ent.*, ix, no. 3, p. 39. Gainesville, Fla., October 1925. [Recd. February 1926.]

Liothrips floridensis, Wats. (camphor thrips) was apparently introduced into Florida from Formosa with the camphor tree itself In Formosa, however, this thrips is scarce and of little economic importance.

BLAISDELL, SR. (F. E.). **Revised Check-list of the Species of *Eleodes* inhabiting America, north of Mexico, including Lower California and adjacent Islands.**—*Pan-Pacific Ent.*, ii, no. 2, pp. 77–80. San Francisco, Cal., October 1925. [Recd. February 1926.]

This list is intended to replace the one given by Leng in the Catalogue of the Coleoptera of America, north of Mexico, and contains references to some species and forms not in that catalogue, 106 species, 67 subspecies, including two new ones, and 12 varieties being dealt with.

CHAMBERLIN (J. C.). **A New Species of *Lepidosaphes* from China (Hemiptera, Coccidae).**—*Pan-Pacific Ent.*, ii, no. 2, pp. 85–87, 2 figs. San Francisco, Cal., October 1925. [Recd. February 1926.]

Lepidosaphes chinensis, sp. n., is described from China on *Magnolia*.

ESSIG (E. O.). **Economic Notes.**—*Pan-Pacific Ent.*, ii, no. 2, p. 92. San Francisco, Cal., October 1925. [Received February 1926.]

Neoborus illitus, Van Duz. (ash leaf bug) occurred in great numbers on Oregon ash [*Fraxinus oregona*] during 1925 in California. According to S. E. Flanders, the mite, *Tyroglyphus farinae*, DeG., has done considerable damage to stored walnuts. The larvae of the Noctuid, *Zale norda*, Smith, injure blackberry plants by feeding on the growing tips; and *Phthorimaea* sp., probably *P. operculella*, Zell., has been reared from larvae found boring in tomato stalks.

Paillot (A.). **Sur une nouvelle maladie du noyau ou grasserie des chenilles de** *Pieris brassicae* **et un nouveau groupe de micro-organismes parasites.**—*C. R. hebdom. Acad. Sci.*, clxxxii, no. 2, pp. 180–182, 1 ref. Paris, 1926.

Another new disease of larvae of *Pieris brassicae* has recently been discovered, connected with nuclear disease [*cf. R.A.E.*, A, xiii, 56] by its aetiological characters and by the lesions it causes. These readily differentiate it from others of the same type. Though it is very contagious and is transmitted by the digestive tract, it does not appear to play an important part in the natural destruction of the caterpillars. The two other types of nuclear disease are the polyhedral diseases of Bombycids and nuclear disease of *Pieris brassicae.* The author erects the genus, *Borrellina,* for the causative organisms, that of grasserie of silkworms [*Bombyx mori*] being *B. bombycis*, that of the new disease of *P. brassicae*, *B. brassicae*, and that of the other nuclear disease of *P. brassicae*, described in the earlier paper [*loc. cit.*] as *B. pieris*.

Lüstner (G.). **Der Fichtennestwickler,** *Epiblema tedella* **Cl.** [The Spruce Tortrix, *E. tedella*.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 2, p. 10, 1 fig. Berlin, February 1926.

The caterpillars of *Epiblema tedella*, Cl., have been very common in the spruce forests in the Rhine districts. The flight period lasts from the end of April to the end of July, and larval feeding begins in mid-May, though the damage does not become noticeable until August and September. The larva enters the base of the needle and lives within it. When it is too large to live inside, it attacks the needle from without, the injured needles being spun together with a web. Both forms of injury cause withering. Between October and December the larvae descend the trees in order to hibernate in the ground litter, and pupate there in the following spring. The injury is not serious, but the growth of the trees may be interfered with if repeated attacks occur.

Brassler (K.). **Die ein- und zweijährige Generation des grossen braunen Rüsselkäfers** (*Hylobius abietis*, **L.**). [The One-year and Two-year Generations of *H. abietis*.]—*Ent. Jahrb.*, xxxv, pp. 120–124. Leipzig, 1926.

The various views regarding the duration of the generations of *Hylobius abietis*, L., are discussed. In 1921 the author found near Munich young adults in autumn that were evidently the progeny of the hibernated mature beetles present in the spring. This one-year generation was due to the exceptionally warm weather in 1921. Under normal conditions the life-cycle of *H. abietis* in southern Bavaria is a two-year one.

Howard (L. O.). **Report [1924-25] of the Entomologist.**—*U.S. Dept. Agric.*, 35 pp. Washington, D.C., 1925.

This annual report presents the usual valuable review of the current insect pest problems in the United States, many of which have already been noticed from detailed papers.

The oriental peach moth [*Cydia molesta*] has been found to develop four or five generations each summer in Georgia. The present distribution of this moth is described. Observations have confirmed the theory that the severity of its attacks will vary with the influence of insect parasites, of which 15 have already been found. The first use of aeroplanes for the control of orchard pests was against the plum curculio [*Conotrachelus nenuphar*] in Georgia. The results were practically as good as those obtained by a ground duster, while a combined fungicidal and insecticidal dust could be applied to about 5,000 trees per hour (including landing and reloading). In observations on the influence of the character of the hibernation quarters on winter mortality, weevils confined in cages on bare ground showed a mortality of 88 per cent., with oak leaves in the cages 64 per cent., with pine needles 48 per cent., and with Bermuda grass 36 per cent. It has been found that a mash of fermented apples has some attraction for adults of the codling moth [*Cydia pomonella*].

The apple flea-weevil [*Orchestes pallicornis*] is increasing in Indiana, and the best method of control (clean cultivation) interferes with the straw-mulch system practised in orchards there. The use of arsenicals on pecan trees has apparently resulted in the increase of an Aphid, *Monellia caryella*, perhaps owing to its effect on natural enemies.

Further investigations have been made of insecticides derived from derris, pyrethrum and *Hura crepitans*. In connection with studies of insect tropisms, an olfactometer has been developed that is fairly satisfactory for certain insects, and by its use practically all the interfering factors can be controlled so that the attractive or repellent responses of a given preparation can be measured. It is found that the odour responses of insects depend largely, if not entirely, on the physiological state of the insect.

In developing and testing the higher fatty-acid emulsion with particular reference to the control of apple Aphids, it was found that the effectiveness of the emulsion was increased when combined with a neutral soap. This emulsion is incompatible with lime-sulphur and Bordeaux mixture, but is compatible with lubricating oil emulsion and can therefore be used in the delayed dormant application for apples against *Aspidiotus perniciosus* and Aphids. It may also be used without the soap spreader in combination with lead arsenate and colloidal sulphur.

Investigations into treatments against the Japanese beetle [*Popillia japonica*] [*R.A.E.*, A, xiii, 128] have been continued [see next paper]. The plan for maintaining a barrier zone against the gipsy moth [*Porthetria dispar*] has proved feasible ; the effectiveness of lead arsenate spray against it is found to be greatly increased by the use of fish-oil as an adhesive. In the Cape Cod area of Massachusetts, a sudden outbreak occurred in spite of many species of parasites being well established in the region. The brown-tail moth [*Nygmia phaeorrhoea*] was less abundant than during the previous year.

The European corn borer [*Pyrausta nubilalis*] has spread rapidly in northern Ohio, adding an area of nearly 9,000 sq. miles to the infested territory; in Michigan also the infested area has largely increased. The alfalfa weevil [*Hypera variabilis*] has been discovered in the great fertile basin of the Mississippi River, where lucerne growing is an important industry. There are indications in the north-central States that a general wave of infestation by the Hessian fly [*Mayetiola destructor*] is beginning. A cutworm, *Euxoa* sp., has been the cause of severe injury in Oklahoma and Kansas. Investigations on the Angoumois grain moth [*Sitotroga cerealella*] in the eastern wheat belt have shown that in wheat fields where the average infestation is 0·26 per cent. there are about 25,000 moths per acre of shocked wheat. It was found that continuation of high temperature from June to October and early or normal harvests have been characteristic of seasons of serious outbreaks while severe winters have had a repressive effect, and no outbreaks have occurred in years when the harvest was late.

Successful experiments have been made to test the value of a vacuum of 24 to 29 inches for the control of pests of stored-products. In a concrete chamber 8 by 8 by 8 ft., especially constructed to withstand high pressures, larvae of the Indian meal moth [*Plodia interpunctella*] and of the meal snout moth [*Pyralis farinalis*] were dead after exposure to a vacuum of from 24·5 to 28 inches for 24 hours. After 48 hours, larvae of clothes moths were brown and brittle, and adults of the granary weevil [*Calandra granaria*] and of the rice weevil [*C. oryzae*] and *Ptinus brunneus* were dead.

Investigations with Mediterranean fruit fly [*Ceratitis capitata*] in Hawaii showed that it can breed in green bananas in cages. This fruit under natural conditions frequently shows egg deposition, and it is thought that successful breeding may occur, though it has not yet been observed.

In the Canal Zone, a Saturniid of the genus *Hylesia*, formerly found almost wholly on mango, occurred abundantly on avocado, stripping the leaves.

Further study of the larger bulb fly [*Merodon equestris*] showed that the larvae pupate at or near the surface of the ground, above the decayed bulb in which they fed. The adults emerge in late April and May; eggs are deposited on or near the bulbs and hatch in 3 or 4 days. Adults of the lesser bulb fly [*Eumerus strigatus*] fed on honey in cages, oviposited on the dry, brown skin at the neck of sound bulbs. Some larvae that hatched late in August pupated a month later, emerged in October and oviposited, while others of the same generation did not emerge until January. Adult females and eggs of the cyclamen mite [*Tarsonemus pallidus*] were able to survive the low temperatures of the past winter on perennial larkspur (*Delphinium belladonna*) and snapdragon (*Antirrhinum* sp.). A 1 per cent. lubricating oil emulsion gave good results. The mite has recently been found infesting narcissus and tulip bulbs. Against the cattleya fly [*Eurytoma orchidearum*] 2 per cent. nicotine dust was satisfactory. A 2 per cent. nicotine dust was also decidedly effective in killing adult moths of *Rhyacionia frustrana bushnelli*. Concentrations of 1 part coconut fatty acid to 200 parts of water or less produced injury to the growth of young citrus trees, but satisfactory control of the citrus aphis [*Aphis pomi* (*spiraecola*)], without injury to the tree, was obtained with

1 part fatty acid to 600 parts of water. Extracts of derris root in sulphonated castor oil have shown great promise against this Aphid.

The Mexican bean beetle [*Epilachna corrupta*] now seems to be a more dangerous pest in the hilly and mountainous regions than in the plains. The insects fly up or down the canyons with the prevailing winds, using them as migration paths both on entering and emerging from hibernation. Beetles appeared 2½ weeks earlier than usual in 1925, probably in consequence of the hot, dry season. Lead arsenate, zinc arsenite and the lead arsenate-lead oleate mixture were all injurious to bean foliage under south-eastern conditions, as well as a sample of magnesium arsenate, but the ordinary commercial form of the latter is not injurious to foliage. Calcium arsenate and lime mixture again proved valuable, though sometimes more toxic to the plants than magnesium arsenate. The sodium fluosilicate recently recommended [*R.A.E.*, A, xiii, 118] showed promise, but was not so uniformly effective at high dilutions as magnesium arsenate or calcium arsenate. Experiments with arsenicals have shown, however, that practically none of these is injurious to beans under arid conditions and at altitudes of from 6,000 to 7,000 ft. The Mexican Tachinid [*Paradexodes epilachnae*] introduced against *E. corrupta* has apparently not become established, while the native species, *Phorocera claripennis*, seems to be rare. The pea aphis [*Illinoia pisi*] was satisfactorily controlled in California by 4 per cent. nicotine dust at the rate of 50 lb. per acre. In Wisconsin, nicotine dust killed only 70 per cent., while an aphidozer collected an average of 82 per cent. No males of *Listroderes obliquus* have yet been found, and reproduction is parthenogenetic. One generation occurs in a year, oviposition beginning in late September and continuing for several months. The weevils begin to appear in December, but none were observed to oviposit until the following autumn. A related insect, *L. apicalis*, has recently been observed in Louisiana; its economic importance is not yet known. The tomato suckfly [*Dicyphus separatus*] has been found for the first time in Mississippi. Studies of the seed corn maggot [*Phorbia cilicrura*] as a potato pest have shown that the character of the soil does not largely affect infestation, but that the insect is attracted to organic fertilisers. The cull onion method of trapping the onion maggot [*Hylemyia antiqua*] has proved very successful; the insects can be easily killed in these onions by treating the rows with road oil or crank-case drainings.

Wireworms in cultivated land in Washington and California winter at a depth of about 10 inches, and at 5 to 8 inches below the surface seemed to be unaffected by frost. They work to the surface and begin feeding in early March, early enough to damage seeds and seedling stocks. It is not known what happens to the first generation adults of the twelve-spotted cucumber beetle [*Diabrotica duodecimpunctata*], which disappear after a short feeding period. In the laboratory two generations have been reared. Undiluted sodium fluosilicate dusted on the beetles kills many of them; dilution with lime materially reduces its effectiveness. Against *Epicauta lemniscata* (blister beetle) arsenicals alone were of little value, but calcium arsenate with an equal proportion of sodium fluosilicate gave good results; the latter used alone was also effective, but both this and the mixture produced some plant injury. In fields infested with the pepper weevil [*Anthonomus eugenii*] between 10 and 100 per cent. of the crop was injured.

Tobacco was injured by wireworms to the extent that as much as 10 per cent. of the crop was lost; a reduction of about 71 per cent. of the adult beetles was obtained by the use of sodium fluosilicate as a bait poison. In the dark-tobacco belt of Virginia, a species of *Crambus* is a very severe pest, the loss in some years totalling over £200,000, and replantings being necessary. One application of a trap bait reduced the infestation by 55 per cent. The practice of not burning sugar-cane trash but ploughing this material in is at last being adopted with very good results, and maize is being planted as far as possible from sugar-cane. Soaking the seed cane before planting in water of ordinary temperature for 72 hours destroyed all borers. Barges were used for this purpose, being filled with cane and then pumped full of water. The germination of the cane was stimulated, and the sugar-cane mealybug [*Pseudococcus calceolariae*] was also controlled by this treatment. The loss from borers in 1924 was estimated at £700,000.

The position with regard to forestry pests is reviewed, and the results of various forest projects are briefly outlined. Defoliating insects included a new species of sawfly and a needle tyer, *Argyrotaenia* (*Eulia*) *pinitubana*, which together killed some 25 sq. miles of lodgepole pine [*Pinus murrayana*]. Along the main highways crossing the belt of infestation arsenical sprays were used with excellent results. Against the elm leaf beetle [*Galerucella luteola*] a Dipterous parasite, *Erynnia nitida*, has been introduced from France.

Investigations on bee culture during the year are outlined.

SMITH (L. B.). **Japanese Beetle Reports.**—*New Jersey Dept. Agric.*, Bulls. 41 & 45, pp. 55–63 & 59–75. Trenton, N.J., September 1924 & September 1925. [Recd. February 1926.]

Much of the information contained in these two reports on the work of the Japanese Beetle Laboratory, Riverton, N.J., covering the period from July 1923 to June 1925, has already been noticed [*R.A.E.*, A, xii, 175, 363, 397; xiii, 127, 338-340, 380–382, 515, 568, 631]. Among the methods tested of freeing nursery stock from Japanese beetle [*Popillia japonica*, Newm.] was the removal of the soil from the roots and substitution of fresh soil. It was found that in the case of evergreen trees up to 6 or 7 ft. high the soil-ball could be removed, and the roots washed, puddled in clay, and repacked in uninfested soil, without seriously damaging the trees, the average loss being not more than 10 per cent. greater than that incurred by transplantation.

The study of cultural methods has shown that the percentage of *P. japonica* destroyed by normal farm practices in central New Jersey is small, although 25–30 per cent. of the eggs can be destroyed by 8 or 10 summer cultivations during the egg-laying season, and 40–50 per cent. of the larvae may be destroyed by late autumn and early spring cultivation. The spread of *P. japonica* is rapid along valleys, where conditions are very favourable to its development, but is retarded to some extent by hilly country; the general trend of distribution seems to be east, south, and west, with less spread to the north. Motor traffic has greatly facilitated its spread across the pine barrens to the coast in New Jersey. In order to protect greenhouses from infestation, copper gauze is now used in place of cloth for screening doors and ventilators, and is more satisfactory.

If nursery stock is moved from the infested area it must be certified to be entirely free from *P. japonica* ; wherever possible plants are transported without soil round their roots, being washed for inspection. For plants that are liable to be injured by washing, treatment with carbon bisulphide emulsion or worm-seed oil emulsion [*R.A.E.*, A, xii, 397 ; xiii, 381] is substituted, the latter, which is the more expensive, being used for certain perennials with matted roots, which are injured by carbon bisulphide. The carbon bisulphide emulsion previously used, in which the emulsifying agent was resin fish-oil soap, was found liable to stratify on standing. For this reason an emulsion was devised, known as carbon bisulphide potassium oleate alcohol emulsion, which does not have this disadvantage. It is made as follows: Dissolve 12·5 lb. potassium hydroxide in 21·4 U.S. gals. denatured alcohol (formula 6) and add 63·76 lb. oleic acid (U.S.P.) ; to this liquid add 751·8 lb. carbon bisulphide. The emulsion resulting from this mixture contains approximately 71·4 per cent. carbon bisulphide. At a temperature of 70° F. the dosage of the above emulsion required for a complete kill of the eggs, larvae, and pupae is equivalent to 30 cc. in 16 U.S. gals. water. The quantities of emulsion used in practice vary from 2½ cc. in 1 U.S. gal. when the soil temperature is 60° F. or above to 5 cc. in 1 U.S. gal. when it is between 35 and 42° F. These dosages are 20–50 per cent. higher than those necessary to obtain complete control in sandy loam, and allow an ample margin of safety for most soils. For special potting soils containing a large proportion of peat the dosage required is higher. The dosages used are in all cases just below the maximum that can be safely applied without causing injury to the plants ; a few species, in fact, receive a temporary check from the treatment.

Owing to the extension of the quarantined area to include southern New Jersey the shipment of sand and soil used for moulding and the manufacture of glassware has assumed importance.

The average number of larvae present in heavily infested localities in autumn was slightly below that for the previous two years, although in a few places there was a large increase. The larvae did not penetrate more than 7–8 inches down into the soil during the winter 1924–25, and the average depth at which they were found was 5 inches, compared with an average depth of 8 inches in the previous winter. The average adult life appears to be about 23 days. Large numbers of the Tachinid, *Centeter cinerea*, Ald., were released in 1923 and 1924, and this parasite has become thoroughly established, being able to survive the winter, as was proved by the capture of parasitised beetles in the spring of 1925. Beetles carrying the eggs of *C. cinerea* have been taken commonly in the field, up to 3–4 miles from the point of liberation. Two other Tachinids, *Ochromeigenia ormioides*, Towns., and *Prosena siberita*, F., have been successfully introduced and liberated ; a female *P. siberita* was found 4½ miles from the point of liberation. Attempts to introduce the Scoliids, *Tiphia* spp. and *Campsomeris* sp., from Korea and China in cocoons were greatly hindered by fungus attacks on the cocoons. During 1925 attempts were to be made to introduce these species as live adults, a method that was successful in the case of *Scolia manilae*, Ashm. [introduced against *Anomala orientalis*, Waterh., *R.A.E.*, A, xii, 421]. A culture of the fungus *Isaria densa*, introduced from France in 1923, was found on a few larvae of *P. japonica* collected in spring, 1924.

A study of the digestive system of *P. japonica* showed that the saliva is normally alkaline (pH 8·2); the digestive juices from the fore-gut are distinctly acid (equivalent to 0·26 per cent. hydrochloric acid); the juices of the midgut and hindgut are alkaline (pH 7·8 to 8). The alkalinity of the saliva probably explains the fact that when lead arsenate is eaten by the beetles it breaks down and acts very quickly. Following up this hypothesis, experiments were made to devise a method of delaying the action of the poison, resulting in the coating of lead arsenate with lead oleate [*R.A.E.*, A, xiii, 631]. As a result of extensive spraying experiments it is stated that *P. japonica* can be controlled on apples, cherries, grapes, and shade trees by careful applications of 3 lb. lead arsenate and 2 lb. flour in 50 U.S. gals. water. On late peaches it can be controlled by spraying with 1½ lb. lead arsenate and 3 lb. freshly slaked lime in 50 U.S. gals. water. The beetles appear in large numbers on early peaches just before they are harvested, so that it is unsafe to spray with arsenicals. Studies of various insecticides indicate that improvements will probably be effected either by the addition of an attractant to lead arsenate or by coating it with a substance which will render it less distasteful and at the same time act as a sticker. Molasses added to lead arsenate spray at the rate of 2 gals. to 50 gals. increased the kill of the beetles actually present on the trees by nearly 40 per cent., as they drank the sweetened liquid while the spray was still wet, but there was apparently no attraction of beetles to the sprayed trees. White materials in spray deposits, such as lime, barytes, china clay, and chalk, are apparently repellent to *P. japonica*, for a short time after they are applied almost as much so as lead arsenate.

Carbon bisulphide emulsion applied with a large quantity of water has been found to kill larvae of *P. japonica* in the soil about the roots of growing nursery stock, to a depth of 2 feet. This method is not, however, successful for the treatment of potted plants. Preliminary experiments with naphthalene and other organic salts for the destruction of larvae in potting soils indicate that these substances may be of some value. Extensive investigations on insecticides are being carried out, including means of preventing the injury caused to foliage by certain chemicals. The addition of a small quantity of mustard oil to carbon bisulphide has been found to increase the toxicity of the latter, both in emulsion and as a gas. It has been found in chemotropic studies on *P. japonica* that the adults are strongly attracted by geraniol, and nearly 50,000 beetles were collected from baits containing this substance during the summer of 1924, the proportion of females to males being approximately 4 to 3. Bait mixtures, notably bran, molasses and geraniol, will retain the geraniol odour for a long time if protected from rain. Eugenol, citrol, and citronellol as attractants, and tar oil as a repellent, appear to have some value.

HEADLEE (T. J.). **Report of State Entomologist.**—*New Jersey Dept. Agric.*, Bull. 38, pp. 107–112. Trenton, N.J., February 1924. [Recd. February 1926.]

In this address to the Ninth Annual State Agricultural Convention the author emphasises the importance of insect pest survey work; had this been carried out in 1914, the infestation of the State by the gipsy moth [*Porthetria dispar*] could probably have been stopped at a comparatively small cost. Now, after the expenditure of large sums, the extermination of the gipsy moth in the State is in sight, but the danger of re-infestation from the New England States would increase greatly should there be a lack of funds for the maintenance of a barrier zone [*R.A.E.*, A, xi, 300]. More funds are also urgently needed for carrying out inspection and certification of farm products on account of the Japanese beetle [*Popillia japonica*], in order to enable them to be sent to other States.

HEADLEE (T. J.). **Insecticides for the Potato Crop.**—*New Jersey Dept. Agric.*, Bull. 39, pp. 178-184, 3 figs. Trenton, N.J., March 1924. [Recd. February 1926.]

Considerable injury to potatoes in New Jersey has been caused by wireworms [probably *Melanotus* spp.] in the last few years [*cf. R.A.E.*, A, xiv, 146]. The species concerned do not seem to be attracted to the potato fields by grass and weeds, as is the case with the common wireworms, but occur in well-cultivated fields. Poisoned baits, consisting of maize seed treated with arsenicals, acids, alkalis, or various organic poisons, were ineffective against these pests, although eaten by them. Occasionally large numbers of the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] hibernate as adults and attack the young potato shoots before they come above ground ; it is suggested that a few rows of potatoes planted very early would serve as trap plants on which the beetles could be killed by dusting the foliage from the time of its appearance with Paris green. Both the potato flea-beetle [*Epitrix cucumeris*, Harr.] and the potato leaf-hopper [*Empoasca fabae*, Harr.] have been abundant on potatoes in New Jersey in recent years ; damage by them can be largely avoided by keeping the foliage coated with either Bordeaux mixture or copper-lime dust. In the early stages of attack by *E. cucumeris*, while the potato plants are too young for spraying with Bordeaux mixture, they should be thoroughly dusted with hydrated lime. The pink and green potato aphis [*Macrosiphum solanifolii*, Ashm.] can be controlled by spraying with nicotine soap and water or with Bordeaux mixture containing 1 gal. 40 per cent. nicotine sulphate in 500 gals. of the spray, or by dusting with 30 lb. of 1½ per cent. free nicotine dolomite dust or 2–2½ per cent. nicotine sulphate dolomite lime dust per acre. An apparatus for mixing the dusts is described and illustrated. The latter dust is more suitable for home manufacture, as the evolution of gas during the process is less rapid and therefore less offensive. For a 2 per cent. nicotine dust the materials are hydrated lime, ground dolomite (magnesium limestone) 100-mesh fine, and 40 per cent. nicotine sulphate, in the proportions 57 : 19 : 4. This paper concludes with a summary of the sprays or dusts that should be applied during the season for the control of the above-mentioned pests.

BATCHELDER (C. H.). **Fluctuation in the Distribution of the Colorado Potato Beetle.**—*Jl. Agric. Res.*, xxxi, no. 6, pp. 541–547, 1 fig. Washington, D.C., 15th September 1925. [Recd. February 1926.]

Although *Leptinotarsa decemlineata*, Say, is an annual and persistent pest, little attention has been given to methods of protecting the potato crop other than the use of arsenical stomach poisons. Recent studies have shown that certain factors cause a variation, even in small limited areas, in the percentage of infestation by this pest. In western

New York and northern Maine these factors are the height of the cultivation ridge, the nature of the previous crop, the earliness in the appearance of the shoot above ground, the deterrent effect of the early sprays, and fluctuations in the numbers of self-sown potato plants. The last constitute a local reservoir from which the adults emerging from pupation or aestivation disperse to adjacent wild plants or cultivated fields. The early crops are most heavily infested, and the dispersal to later varieties is slow and inconsiderable except where influenced by spraying. Infestation is less severe where the high ridging and covering method of cultivation is employed, and also where potatoes are not grown for two years in succession.

HAYES (W. P.) & JOHNSTON (C. O.). **The Reaction of certain Grasses to Chinch-bug Attack.**—*Jl. Agric. Res.*, xxxi, no. 6, pp. 575–583. Washington, D.C., 15th September 1925. [Recd. February 1926.]

The following is the authors' summary of this paper: During 1924, grasses at the Kansas Agricultural Experiment Station were attacked by large numbers of *Blissus leucopterus*, Say (chinch bugs), which migrated from adjacent wheat fields after harvest. The different species showed different degrees of resistance to injury, and some of them exhibited marked ability to recover from the attack (these included *Festuca rubra* and *F. ovina*, which are introduced perennials). It was apparent that native perennial species with harsh tissues were able to survive chinch-bug injury and showed the most marked ability to recover. These grasses comprise about 80 per cent. of the native prairie grasses of Kansas.

Besides the data regarding the resistance and recovery of the grasses, a large number of species of grasses not heretofore recorded as food-plants of the chinch-bug are enumerated.

CHAPMAN (R. N.) & JOHNSON (A. H.). **Possibilities and Limitations of Chloropicrin as a Fumigant for Cereal Products.**—*Jl. Agric. Res.*, xxxi, no. 8, pp. 745–760, 5 figs., 22 refs. Washington, D.C., 15th October 1925. [Recd. February 1926.]

There is a great demand for an effective but less inflammable material than carbon bisulphide as a fumigant for pests of stored products. Previous work on chloropicrin for this purpose is reviewed. In the present experiments it was tried under laboratory and natural conditions against *Calandra granaria*, L. In practical application, the material gives a quicker and more uniform action when it is atomised, a pressure sprayer throwing a fine mist being considered the most satisfactory method. By virtue of its powers of penetration, chloropicrin is able not only to penetrate materials that contain insects, but also to escape through the walls of the fumigation chamber so rapidly that its concentration may soon fall below the lethal point. When it is applied as a spray, the surface is greatly increased, thus enabling it to volatilise quickly and build up a high concentration in the atmosphere before it begins to escape. Also the spray can be directed to the infested areas, thus giving the insects a saturated atmosphere at the beginning.

The effect of chloropicrin on yeast activity and on the proteins of flour and wheat is discussed; in all cases it is detrimental, and even a small quantity in the flour reduces its ability to produce a good loaf of bread. Both the flour and the wheat, however, are able to recover these effects if exposed to the air, the recovery being slightly more rapid in the case of wheat. No detrimental effect, at least so far as the baking qualities were concerned, was noticed in flour that had been stored in cloth sacks for a month after treatment.

The factors of time and temperature bear an inverse ratio to each other when concentration varies from 1 gm. to 125 gm. per cu. metre. When concentration is constant, the time required to kill bears a linear relationship to temperature, and this relationship continues down to 0° C.

PARKER (J. R.). **Observations on the Clear-winged Grasshopper** (*Camnula pellucida*, **Scudder**).—*Minnesota Agric. Expt. Sta.*, Bull. 214, 44 pp., 6 figs., 5 refs. University Farm, St. Paul, Minn., July 1924. [Recd. February 1926.]

This bulletin is the result of 12 years' study of *Camnula pellucida* (clear-winged grasshopper) under the semi-arid conditions of Montana and the more humid conditions of northern Minnesota. The responses of this insect to meteorological factors are discussed.

The author's summary is as follows: Amyl acetate was the most effective of several materials used as attractants in grasshopper baits, surpassing butyl and propyl acetate, lemons and synthetic apple flavouring. All attractants except lemons gave better results when used in combination with molasses. Salt not only added to the effectiveness of all attractants with which it was combined, but in some tests ranked very high when used alone. Grasshopper baits for use in Minnesota should contain amyl acetate, molasses, and salt, in addition to the basic ingredients—bran, arsenic and water; (the formula recommended is 100 lb. coarse bran, 5 lb. arsenic, 5 lb. salt, 2 U.S. gals. molasses, 3 oz. amyl acetate and 10–12 U.S. gals. water). The activities of *C. pellucida* are to a large extent controlled by temperature. The range of normal activity extends from approximately 68 to 104° F. Little movement is seen at air temperatures below 60° F., and several hours' exposure at 40° F. renders it completely dormant. Fatal temperatures for a 12-hour exposure are reached at 17·6° F. Fatal high temperatures for 10-minute exposures occur at 122 to 136° F., several specimens surviving the latter temperature, however. *C. pellucida* prefers to rest on surfaces the temperatures of which approximate to 98 to 100° F. The surface of the ground frequently is much warmer than this, but the grasshopper can generally reach a temperature it prefers by simply climbing up weeds or grass to two inches above the ground, this sometimes making a difference of 39·6° F. Maximum feeding at poisoned bran mash occurs when the air temperature first reaches from 73 to 77° F. A comparison of tin pans and boards for containers of poisoned bran mash in conducting grasshopper bait tests showed that the surface of the boards was much warmer than the surface of the pans. This caused the grasshoppers to seek the boards for warmth during the cooler hours of the day and to avoid them during the hottest hours, thus introducing a serious experimental error. Continual high relative humidity is detrimental to *C. pellucida*, as it brings about conditions favourable to the development of diseases. In Minnesota, the nymphs did not migrate, and no congregating of the adults in definite areas for egg-laying was witnessed. This is in marked contrast to the habits of the same species in Montana and Utah, where migrations of the young nearly always take place and the adults over a considerable area gather in a few places for mating and egg-laying.

CARTER (W.) & RUGGLES (A. G.). **Common Alfalfa Insects.**—*Univ. Minnesota Agric. Extens. Div.*, Spec. Bull. 99, 8 pp., 5 figs. St. Paul, Minn., August, 1925. [Recd. February 1926.]

In Minnesota the growing of lucerne is extending very rapidly. The more important insects attacking either the crop or the seed include grasshoppers, for which the usual poison bait [see preceding paper] should be applied early in the season while the insects are still small and before they have been able to retard the growth of the plants ; blister beetles [*Epicauta* spp.], which generally appear suddenly in scattered infestations and should at once be treated on the infested areas with a dust of 15 parts (by measure) hydrated lime to 1 part of crude white arsenic or Paris green ; sugar-beet webworm [*Loxostege sticticalis*], which does not cause much damage to lucerne, and for which the same dust may be used ; cutworms, for which trenching and poison baits are recommended ; and alfalfa seed thrips [*Frankliniella occidentalis*], which produces the condition known as " blasted buds." If the first crop is to be used for seed, it is advisable, as a check to thrips, to mow over the lucerne as soon as it is high enough to make this possible, but if it can be used as pasture until the end of May, much better control can be obtained, as many adults are eaten with the leaf buds. If the second crop is left for seed, the first crop should be cut earlier, just as the blossoms are appearing. The most serious insect pest directly affecting the seed crop is the alfalfa seed Chalcid [*Bruchophagus funebris*], the larva of which eats out the seed, leaving only a shell. Breeding continues as long as green lucerne seeds are available for oviposition. The generation that winters in the seed emerges in the spring to continue the infestation on blossoming clover and lucerne growing by the roadside and headlands, so that by the time lucerne in the field is seeding the first generation has emerged and is ready to infest the main crop. These self-sown plants should be mown down or used as pasture ; seed should be thoroughly cleaned and the trash from thresher and cleaning mill burnt. After growing lucerne for 4 or 5 years, a rotation of cereals for one year will keep such pests as wireworms and white grubs in check.

The alfalfa weevil [*Hypera variabilis*] has not yet appeared in Minnesota.

DAVIS (W. T.). **The Grasshopper,** *Melanoplus differentialis*, **on Staten Island, N.Y.**—*Bull. Brooklyn Ent. Soc.*, xx, no. 5, p. 199. Lancaster, Pa., December 1925.

Since the original record of *Melanoplus differentialis*, Thom., in New York State [*R.A.E.*, A, xiii, 177] four further individuals have been found on Staten Island, whither they had probably been carried by the railway.

GUYTON (T. L.). **Greenhouse Fumigation.**—*Pennsylvania Dept. Agric.*, Gen. Bull. 413, 8 pp., 3 figs. Harrisburg, Pa., 1st October 1925. [Recd. February 1926.]

Calcium cyanide is recommended as the cheapest and most effective fumigant for insect pests in greenhouses. The method of calculating the cubic space in such houses is explained, and it is suggested that, f the house is fairly air-tight, one-eighth ounce per 1,000 cu. ft. will be sufficient. Lists are given of the plants that have been successfully fumigated and of those that have been injured by the gas.

European Corn Borer Control and Quarantine Regulations.—*Pennsylvania Dept. Agric.*, Gen. Bull. 414, 8 pp., 2 figs., 1 map. Harrisburg, Pa., 15th October 1925. [Recd. February 1926.]

The European corn borer [*Pyrausta nubilalis*, Hb.] is spreading rapidly in north-west Pennsylvania, sixteen counties being now nfested, and farmers are urged to follow the cultural measures usually recommended in order to avoid serious losses. The quarantine regulations issued for the State of Pennsylvania are quoted.

PETTIT (R. H.). **The Present Status of the European Corn Borer in Michigan.**—*Michigan Agric. Expt. Sta.*, Circ. Bull. 70, 14 pp., 13 figs.; *Qtrly. Bull. Michigan Agric. Expt. Sta.*, viii, no. 2, pp. 59–61, 1 fig. East Lansing, Mich., November 1925. [Recd. March 1926.]

These accounts of the life-history and control of the European corn borer [*Pyrausta nubilalis*, Hb.] emphasise the importance of preventing ts further spread in Michigan.

Quarantine on account of the European Corn Borer.—*Wisconsin State Dept. Agric.*, Circ. 18, 3 pp. Madison, Wis., July 1924. [Recd. March 1926.]

This quarantine against *Pyrausta nubilalis*, Hb., makes the protective measures in Wisconsin conform to those of the Federal Government [*R.A.E.*, A, xii, 577].

Quarantine on account of Gipsy Moth and Brown-tail Moth.—*Wisconsin State Dept. Agric.*, Circ. 19, 3 pp. Madison, Wis., August 1924. [Recd. March 1926.]

This quarantine order repeals former State regulations against *Porthetria dispar* and *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*) nd makes the protective measures in Wisconsin conform to those of he Federal Government.

Revision of Alfalfa Quarantine.—*Wisconsin State Dept. Agric.*, Circ. 23, 3 pp. Madison, Wis., 30th November 1925. [Recd. March 1926.]

This is a revision of Quarantine no. 6 [*R.A.E.*, A, xii, 14] prohibiting he importation into Wisconsin of lucerne and hay of all kinds and cereal straw from the infested areas of the Rocky Mountain States, n account of *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.). Restrictions are also placed on shipments of lucerne meal.

West Virginia Crop Pest Law and Rules and Regulations of the Commissioner.—*W. Virginia Dept. Agric.*, Bull. 63, 15 pp. Charleston, W. Va., October 1925. [Recd. January 1926.]

This is a reprint of the Act of 1917 to prevent the introduction and spread in West Virginia of *Aspidiotus perniciosus*, Comst., *Aulacaspis pentagona*, Targ., *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., *Aegeria* (*Sanninoidea*) *exitiosa*, Say, *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, L.), *Porthetria dispar*, L., *Cydia* (*Laspeyresia*) *molesta*, Busck, *Popillia japonica*, Newm., and *Tylenchus tritici*, Bast.

Modification of Nursery Stock, Plant and Seed Quarantine Regulations. Amendment no. 4 of Revised Rules and Regulations Supplemental to Notice of Quarantine no. 37.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 1 p. Typescript. Washington, D.C., 31st December 1925. [Recd. February 1926.]

Details are given of various bulbs, stocks, cuttings, scions and buds of fruits for propagation, rose stocks for propagation, nuts, including palm seeds for propagation, and seeds of fruit and other trees and shrubs and of hardy perennial plants that may be imported under permit into the United States from countries that maintain inspection. These may also be introduced by permit from countries not maintaining inspection, in limited quantities for experimental purposes only.

This amendment became effective 1st January 1926.

Modification of Pink Bollworm Quarantine. Amendment no. 5 to Second Revision of Regulations Supplemental to Notice of Quarantine no. 52.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 1 p. Washington, D.C., 25th November 1925. [Recd. February 1926.]

This modification revises the regulations [*R.A.E.*, A, xi, 426; xii, 30, 330, 372, 500] regarding interstate movement of baled cotton lint and lintners on account of the reappearance in New Mexico of the pink bollworm [*Platyedra gossypiella*, Saund.].

Cushman (R. A.). U.S. Bur. Ent. **Location of Individual Hosts versus Systematic Relation of Host Species as a determining Factor in Parasitic Attack.**—*Proc. Ent. Soc. Washington*, xxviii, no. 1, pp. 5–6. Washington, D.C., January 1926.

The author points out that while it has generally been believed that Hymenopterous parasites were closely confined in their host relations to certain groups and were possessed of an unerring instinct that guided them in their search for hosts, they have frequently been reared from some other host that chooses the same sort of situation as their usual ones, and that, in fact, the situation in which a host is found is nearly, if not quite, as important as the systematic position of the host insect. Thus, *Epiurus pterophori*, Ashm., normally a parasite of Lepidopterous larvae living in weed stems, has been reared from larvae of the sawfly, *Ametastegia glabrata*, Fall., that had bored into weed stems for pupation; and several individuals of *Sympiesis* sp. were reared as external parasites of eggs of the sawfly, *Cimbex americana*, Leach, in willow leaves, although typically parasitic on leaf-mining Lepidoptera. Species of this genus have also been reared from such leaf-mining hosts as the Coleoptera, *Odontota* and *Orchestes*, the Dipteron, *Agromyza* and the Hymenopteron, *Caulicampus*. So far as the parasite was concerned the important factor in each of these cases was not the systematic relation of the host, but the fact that it was mining in a leaf.

GAHAN (A. B.). U.S. Bur. Ent. *Coccophagus lecanii* (**Fitch**) **erroneously recorded from Japan** (**Hymenoptera**).—*Proc. Ent. Soc. Washington*, xxviii, no. 1, p. 24. Washington, D.C., January 1926.

The author points out that the Chalcid parasites of Coccids referred to as *Coccophagus lecanii*, Fitch, in Japan [*R.A.E.*, A, ix, 453; xii, 465] were misidentified. Further examination has convinced him that these parasites are without doubt *C. japonicus*, Comp. *C. lecanii* apparently does not occur in Japan.

CARSNER (E.). **Attenuation of the Virus of Sugar-beet Curly-top.**—*Phytopathology*, xv, no. 12, pp. 745–757, 5 pls., 4 refs. Lancaster, Pa., December 1925.

In 33 experiments, leafhoppers [*Eutettix tenella*] the progeny of infected parents, reared on *Chenopodium murale* infected with curly-leaf disease of sugar-beet, were caged on healthy sugar-beets or other susceptible plants. The plants remained healthy in 20 cases, and in the remainder they developed only mild symptoms of the disease. The virus is, therefore, attentuated by its passage through *C. murale*.

The fact that the leafhoppers may acquire the attenuated virus from *C. murale* does not interfere with their acquiring and transmitting the more active form of it. Leafhoppers from a severely affected beet caused severe disease on beets affected with the mild form of the disease, as well as on healthy controls. Experiments with *Rumex crispus* and *Suaeda moquini* gave similar results.

The attenuated virus has been found to occur in leafhoppers when collected from their natural breeding-places, and it is supposed that the attenuation in these cases had resulted from the passage of the virus through resistant plants.

WALKER (M. N.). **The Relation of certain Species of** *Physalis* **to the Overwintering of the Mosaic Disease of Cucumber.**—*Phytopathology*, xv, no. 12, pp. 733–744, 2 pls., 15 refs. Lancaster, Pa., December 1925.

The mosaic disease of *Physalis pubescens* in Wisconsin is readily transmitted to cucumbers by *Aphis gossypii*, and cucumber mosaic is similarly transmissible to *P. pubescens*. Infection can be secured between these plants by artificial inoculation also, but the percentage of infection is lower. The mosaic disease of pokeweed [*Phytolacca decandra*], tobacco and tomato are also transmissible to *Physalis pubescens* by Aphids. *P. pubescens* is an annual, and the disease is not transmitted through the seed. It has been found that a mosaic disease lives over winter in two perennial species, *P. subglabrata* and *P. heterophylla*. The disease of these plants is readily communicated to cucumber by *A. gossypii* and by artificial inoculation, and is also transmissible to *P. pubescens*.

Flea-beetles are commonly present on *Physalis* spp. and are thought by some authors to transmit the mosaic disease. Aphids are probably of chief importance, however, and when mosaic once appears in a cucumber field and these insects are abundant, the disease spreads very rapidly. In the autumn, cucumber plants die before *Physalis* spp., and Aphids or other insects migrating to these plants while they are still green may transmit cucumber mosaic to them, thus establishing a source of primary infection in the following spring.

DOOLITTLE (S. P.) & JONES (F. R.). **The Mosaic Disease in the Garden Pea and other Legumes.**—*Phytopathology*, xv, no. 12, pp. 763–772, 1 pl. Lancaster, Pa., December 1925.

Mosaic diseases of both the edible and sweet pea in Wisconsin are transmissible by the pea aphis, *Illinoia* (*Macrosiphum*) *pisi*, Kalt., and by artificial inoculation. Red clover mosaic has been transmitted to the garden pea and sweet pea by artificial inoculations and to the former by means of Aphids. Red clover also appears to be susceptible to the mosaic occurring on these plants. Since red clover is a perennial on which the pea aphis is said to over-winter, it is probable that the Aphids, migrating from clover to peas in the spring, act as carriers of the disease. There is no evidence of transmission of the disease through the seed.

KUNKEL (L. O.). **Incubation Period of Aster Yellows in its Insect Host.**—*Phytopathology*, xvi, no. 1, p. 67. Lancaster, Pa., January 1926.

Transmission experiments indicate that the virus of aster yellows passes through an incubation period in its insect host, *Cicadula sexnotata*, Fall. The period varied somewhat in different experiments. In the case of nymphs, two weeks and more must usually elapse before uninfected insects, exposed to diseased plants, are able to transmit the disease to healthy ones. The incubation period is somewhat shorter in adult insects, and is usually from six to ten days. Insects, once infected, apparently never lose their ability to transmit aster yellows.

LEACH (J. G.). **The Relation of the Seed-corn Maggot to Potato Blackleg.**—*Phytopathology*, xvi, no. 1, p. 68. Lancaster, Pa., January 1926.

The seed-corn maggot, *Phorbia cilicrura*, Rond. (*fusciceps*, Zett.) is an agent of dissemination, inoculation and hibernation of bacteria capable of causing potato blackleg [*cf.* *R.A.E.*, A, xiii, 176]. These are constantly associated with the insect and are necessary for the normal development of the larvae. Bacteria do not occur inside the eggs, but are commonly present on their surface. Virulent pathogenic bacteria are present in the puparia and emerge with the adults. Pathogenic bacteria are also commonly present in the intestinal tract and excrement of adult flies. Eggs are deposited in the soil on or near healthy seed-pieces or sprouts. On hatching, the larvae burrow into the seed-piece and inoculate it with bacteria, which spread into the stem, causing blackleg. The insect has been responsible for outbreaks of blackleg in fields planted with carefully treated seed from fields known to have been free from the disease. Control measures have not yet been devised.

GRANOVSKY (A. A.). **Studies on Leafhopper Injury to Apple Leaves.**—*Phytopathology*, xvi, no. 1, p. 76. Lancaster, Pa., January 1926.

During the past three years the leafhoppers of polyphagous habits, such as *Empoasca fabae*, Harr. (*mali*, Le B.), *E. flavescens*, F., and *Cicadula sexnotata*, Fall., were present in abundance in apple orchards of the Peninsular region of Wisconsin, the first being the most abundant. At the same time various degrees of apple leaf injury were observed, which could not be ascribed to any recognised cause. The injury manifested itself in characteristic marginal discolouration of the leaves, and this gradually progressed downward along the lateral veins; the tips and the distal margins of the leaves curled upwards, much resembling the hopperburn injury of potatoes. Experiments by means of caging leafhoppers over the terminal spurs of apples indicate that this type of discolouration is due to the feeding of these insects, and probably to some toxic or infectious agent. Prolonged confinement of the insects intensifies the symptoms. Needle inoculations with the macerated leafhoppers produce similar injuries. The sap of diseased leaves gives a relatively low percentage of infection.

CARSNER (E.). **Resistance in Sugar-beets to Curly-top.**—*Phytopathology*, xvi, no.1, pp. 87-88. Lancaster, Pa., January 1926.

Brief notes are given on a preliminary experiment made with the object of obtaining a strain of sugar-beet resistant to curly-leaf disease transmitted by *Eutettix tenella*. It appears probable that a satisfactory strain may be produced.

Insect Pests.—*37th Ann. Rept. Tennessee Agric. Expt. Sta., 1924*, pp. 27–31, 9 figs. Knoxville, Tenn., 1925.

The Mexican bean beetle [*Epilachna corrupta*, Muls.] and the cotton boll weevil [*Anthonomus grandis*, Boh.] are the two most serious insect pests in Tennessee; the use of sodium fluosilicate and hydrated lime (1 : 9 by volume) for dusting against them has already been noticed [*R.A.E.*, A, xiii, 118]. The woolly apple aphis [*Eriosoma lanigerum*, Hausm.] is an important pest of apple in the State. The stem-mother hatches in February from an egg laid on elm and moves to a bud, which she stimulates to early growth, so that it produces a rosette of curled leaves before the normal buds have opened. Reproduction takes place on the rosette, and in May the numerous winged Aphids migrate to apple. A rhinoceros beetle [*Strategus antaeus*, F.] was found damaging young peach trees [*R.A.E.*, A, xii, 585].

WEIGEL (C. A.). **The Strawberry Rootworm, a new Pest on Greenhouse Roses.**—*U.S. Dept. Agric.*, Dept. Bull. 1357, 48 pp., 16 figs., 32 refs. Washington, D.C., January 1926.

The life-history of *Typophorus* (*Paria*) *canellus*, F., which has been a serious pest of greenhouse roses in the eastern United States since

1916, is described [*R.A.E.*, A, x, 218, 246, 481]. The recorded food-plants not previously noticed are peach, oats, millet, rye, *Juglans* spp., grape, *Aster ericoides*, *Potentilla* spp., and *Sorbus* spp. Two varieties occur on greenhouse roses, *T. canellus* var. *quadrinotatus*, Say, and *T. canellus* var. *gilvipes*, Crotch. The former is the commoner, and nearly all the observations on the adults in the present paper refer to it. All stages are described and illustrated. There are two generations a year in greenhouses. Oviposition begins in March and continues into May, by which time adults have developed from the first eggs laid in March. These adults lay eggs from which a second brood of adults is produced in September and October. The adults of the second brood do not normally lay any eggs until the following spring, passing the winter in a state of semi-hibernation. In breeding-cages a few eggs were laid in December-February. Adults emerging in the spring and summer probably live for 75–100 days under favourable conditions, while those emerging in the autumn may live much longer. One female is probably able to lay, on an average, 135 eggs, and the oviposition period of an individual may extend over several months. *T. canellus* is apparently entirely parthenogenetic in greenhouses, as no males have ever been discovered in them. The percentage of fertile eggs laid is very high.

No parasites of *T. canellus* have been found in greenhouses; spiders, toads and Carabid beetles are occasional predators, but are not of any importance as natural enemies.

The information on the control measures on roses in greenhouses has almost all been noticed previously [*R.A.E.*, A, viii, 312; x, 218, 481; xi, 412 (where the plants infested were erroneously stated to be strawberries)]. A layer of tobacco dust on soil was found to kill all newly-hatched larvae placed on it, and it is thought that a considerable degree of control was obtained by applying a mixture of wood ashes and tobacco dust to the surface of the soil of rose beds at intervals of about two weeks during the spring.

McColloch (J. W.). **Chinch-bug Barriers for Kansas Conditions.**—*Kansas Agric. Expt. Sta.*, Circ. 113, 6 pp., 3 figs. Manhattan, Kans., June 1925. [Recd. February 1926.]

Experiments in 1924 showed that the most satisfactory barrier for the control of chinch-bugs [*Blissus leucopterus*, Say] migrating from wheat to maize or *Sorghum* is one consisting of a line of creosote with post-holes at intervals [*R.A.E.*, A, viii, 504]. From ¼ to ½ oz. of calcium cyanide is placed in each post-hole daily, the insects being guided into the holes by a wing of creosote at right angles to the main line. Lines of calcium cyanide may be substituted for the post-holes and wings of creosote [*R.A.E.*, A, xii, 370], but are less satisfactory when there is a strong breeze or low humidity, and are more expensive. The cost for 10 days of a creosote post-hole barrier, which must be renewed daily, was about £12 per mile. Careful counts and estimates showed that at no time did more than 1 per cent. of the migrating chinch bugs cross the barrier, and most of the time the number crossing was less than one-tenth of this. Tar barriers [*cf. R.A.E.*, A, xiii, 43] were less satisfactory than creosote barriers and somewhat more expensive as they require to be renewed more often. Dust barriers [*R.A.E.*, A, ii, 228; viii, 504] were rendered ineffective by rain; they can only be made on certain soils and require considerable labour in construction.

PETTIT (R. H.). **Report of the Section of Entomology.** [**Experiment Station.**]—*63rd Ann. Rept. State Bd. Agric. Michigan 1923–24*, pp. 209–219, 13 figs. East Lansing, Mich., 1925. [Recd. March 1926.]

Damage to public buildings and dwellings by *Reticulitermes* (*Leucotermes*) *flavipes* is quite common in Michigan, and it is often well established before its presence is evident [*R.A.E.*, A, xiii, 35]. Pot experiments have shown that young apple-trees infested with woolly-aphis [*Eriosoma lanigerum*] can be safely treated with paradichlorobenzene, which kills the subterranean Aphids. During the autumn of 1923 plums and apples were attacked by the weevil, *Cryptorrhynchus lapathi*, the adults eating into the fruit. Proprietary miscible oils were tried against *Chionaspis pinifoliae* (white pine scale) on six year old pine trees which were thoroughly drenched at a pressure of 250 lb. Many eggs were killed outright, and where the larvae hatched they did not survive. A Hymenopterous parasite, a new species of *Prospaltella*, has been reared from *C. pinifoliae*. *Pyrameis* (*Vanessa*) *cardui* was unusually abundant on thistles, peppermint and soy beans being eaten when these failed. *Emphytus canadensis* (violet sawfly) attacked pansies, but is controlled by hellebore dust or arsenicals. Lead arsenate, 2 lb. powder to 50 U.S. gals. water, proved an effective spray for the control of *Rhynchaenus* (*Orchestes*) *canus* (apple flea weevil). The first spray was applied when the weevils first appeared in large numbers (9th May) and was followed by several further ones. *Janus integer* (currant stem-girdler) is recorded for the first time from Michigan as a pest of currants. After depositing an egg in a puncture made in the new growth, the adult cuts partly through the twig above it. The twig finally drops off, leaving a stump with the egg embedded in it. The larva tunnels down the pith and about September spins a cocoon in the burrow. It generally pupates the following season, the adults emerging about May or June. The only remedy is to cut off a few inches of the tips and burn them. In June about two inches is enough, but later more must be cut to include the end of the burrow. The injury to *Thuja* by the larvae of *Argyresthia thuiella* (arbor-vitae leaf-miner) is increasing.

Sprays have been tested for the control of *Pseudococcus maritimus* attacking grapes. Though the conditions of the experiments were not favourable enough for reliable results, they show that the regular dormant spray of lime-sulphur is better than any of the oil or nicotine sprays applied at that time. Owing to the rapid development of the buds and later of the shoots, this spray can only be safely applied over a very short period. A flea-beetle, *Longitarsus* sp., caused considerable injury to peppermint, the attacked plants being stunted and of a brilliant red colour. Thorough disking of the soil and poisoning the adults at the time of harvest are recommended for its control.

MARLATT (C. L.). **Report [1924-25] of the Federal Horticultural Board.**—*U.S. Dept. Agric.*, 23 pp. Washington, D.C., 1925. [Recd. February 1926.]

This report deals with the activities of the Federal Horticultural Board in the enforcement of the Plant Quarantine Act during the year.

COMPTON (C. C.). **Insects feeding on Truck and Garden Crops, and How to Control Them.**—*Illinois Agric. Expt. Sta.*, Circ. 297, 46 pp., 17 figs. Urbana, Ill., June 1925. [Recd. February 1926.]

The vegetable crops of Illinois in 1920 were valued at nearly £4,000,000, of which approximately £800,000 is estimated to have been lost in consequence of insect depredations, and this loss of 20 per cent. is considered to be about an average one. While the use of insecticides is essential to the maximum production of most vegetable and garden crops, cultural methods are of great importance in preventing loss from insect pests ; this fact is often overlooked by growers who rely entirely on spray schedules. The present circular reviews both the spraying and cultural methods that have been found most effective against the common insect pests of vegetables and gardens in Illinois. The insects are dealt with in the order of their importance under the various crops attacked, and salient points in the life-history are given with a brief description of each insect.

KOTILA (J. E.) & COONS (G. H.). **Potato Spraying and Dusting Experiments in Michigan.**—*Michigan Agric. Expt. Sta.*, Tech. Bull. 72, 15 pp., 1 fig., 2 pls., 12 refs. East Lansing, Mich., October 1925. [Recd. March 1926.]

As a result of field tests for the comparison of dusts and sprays for the control of hopperburn [caused by *Empoasca fabae*, Harr.] and foliage disease of potatoes, spraying with Bordeaux mixture is recommended owing to its relative cheapness and dependable character. The stimulative effect on the plants sometimes attributed to this spray was not demonstrated in the present tests.

FRACKER (S. B.) & VAUGHAN (R. E.). **Control of Insects and Plant Diseases.**—*Wisconsin State Dept. Agric.*, Bull. 36, 4th edn., 10 pp., 1 fig. Madison, Wis., April 1925. [Recd. March 1926.]

A spray calendar is given for apples, plums, cherries and small fruits, and the more common spray materials and their purpose are described.

ABBOTT (W. S.), CULVER (J. J.) & MORGAN (W. J.). **Effectiveness against the San José Scale of the Dry Substitutes for Liquid Lime-sulphur.**—*U.S. Dept. Agric.*, Dept. Bull. 1371, 26 pp., 25 refs. Washington, D.C., January 1926.

The value of the various dry substitutes for liquid lime-sulphur in sprays for the control of *Aspidiotus perniciosus*, Comst. (San José scale) appears to be disputed. The existing literature on this subject is reviewed. In view of the very conflicting data, experiments were made with dry calcium-sulphur, dry sodium-sulphur, and dry barium-sulphur. They were conducted under practical orchard conditions in four different States and cover a period of three years. Both apple and peach trees were used, and conditions varied from a moderate infestation to incrustation.

The results showed that the commercial samples of these forms of sulphur, even when used at strengths much greater than ordinarily employed, do not furnish a satisfactory control of this scale.

Hartzell (F. Z.). **Susceptibility to Dust and Spray Mixtures of the Pear Psylla** (*Psylla pyricola*, **Förster**).—*New York State Agric. Expt. Sta.*, Bull. 527, 123 pp., 12 pls., 1 map, 9 refs. Geneva, N.Y., July 1925. [Recd. February 1926.]

Tests were made during 1920–1923 of more efficient methods of repressing *Psylla pyricola*, Först., which is the most important insect pest of pears in New York State. The measures recommended apply particularly to that State and might require some modification under other conditions of climate and environment. The life-history, bionomics and migration habits of the insect are discussed, and details of the many experiments in control are given and the methods of computing the results explained. Lime-sulphur, 1 : 8, was found to be very a efficient ovicide in one orchard where no egg-laying occurred just previous to or after spraying. The control was quite inadequate in the other experimental orchards because prolonged oviposition was responsible for too many eggs being laid just before and just after application. Dilutions of lime-sulphur of 1 : 20, 1 : 15, and 1 : 8 gave similar results, as did the use of 25 lb. dry lime-sulphur in 100 U.S. gals. water. These sprays were applied early in May, but the oviposition period is so often prolonged that there is no definite stage during which a sufficient number of eggs can be destroyed to secure adequate control. The nymphal periods of the first two generations are, however, sufficiently definite to secure control by means of nicotine sprays, and there are intervals of a few days or a week during these periods when most of the insects are in either the hard-shell nymph or adult stage and can be controlled by nicotine dusts. Spraying against the nymphs is recommended in localities where egg sprays are ineffective or have been omitted. Two are generally necessary; one shortly after the petals have fallen and one in July. The most promising spray was 2½ U.S. gals. lime-sulphur, 40 lb. hydrated lime, 3 lb. lead arsenate [against *Cydia pomonella*, L.], and 1 U.S. pint nicotine sulphate in 100 U.S. gals. water. During 3 seasons this spray gave an average control of 97·4 per cent. The addition of calcium caseinate to the above mixture did not increase the efficiency nor prevent foliage injury (which was considerable in some field tests). Nicotine sulphate (1 pint in 100 gals. of water) is the most effective nymphal spray, but fungicides that are safer to pear foliage must be substituted for lime-sulphur. Nicotine sprays were generally more successful than nicotine dusts. Extensive dust trials were made in 1923 and showed that 1 per cent. free nicotine dust controlled adults practically as well as stronger mixtures, but failed to kill the nymphs. Nicotine dust containing organic materials failed to kill even the adults. Dusts containing 2 per cent. free nicotine appeared to be slightly more toxic than those containing an equivalent amount of nicotine sulphate, but more experiments are needed to prove this point.

Dusting is recommended to supplement spraying in large commercial orchards where time is an important factor and should generally be done from 7 to 10 days after spraying. The best dosage proved to be 1 lb. of 2 per cent. lime-nicotine dust to occupy not more than 1,500 cu. ft. of tree volume or 1,900 cu. ft. of tree space. (Tree volume is defined as the contents of an imaginary right cylinder having the same diameter and height as the tree in question; tree space is the volume of an imaginary parallelepiped having a base equal to the planting distances and a height the same as the tree studied.) Dosage appeared to be the most important factor in dusting. The temperature influence was apparently small, and the percentage of open space did not seem highly important. Dusting should, however, be done, if possible, at temperatures about 70° F., but never below 60° F. The best control was obtained on low-headed, well pruned trees. The concomitancy between wind velocity and control was rather low, but positive, and indicated that light wind assisted in dusting, while during calm periods the dust was apt to spread into the untreated trees. Rather high relative humidity seems to favour the liberation of nicotine fumes, but rain should be avoided for at least half a day. Dusting should begin on the leeward side of the orchard and progress to the windward, but enveloping the windward side of each tree first and then treating the leeward side, driving the dust upward through the tree with adequate pressure. Surrounding trees should also be dusted, if possible. Factors lowering the efficiency of insecticides are improper time of application, improper pruning, proximity to infested plantings and lack of thoroughness, low pressure for sprays (200 lb. pressure is necessary), improperly adjusted apparatus, high wind, or failure to cover all parts of the tree.

The larger plantings are generally more seriously infested than smaller, isolated orchards. Protection from wind appears to favour infestation. Owing to the extensive autumn migration of *P. pyricola*, it does not seem to be practicable to exterminate it, except perhaps in very isolated orchards, but the aim should be to secure sufficient control to ensure healthy foliage and fruit free from black mould, repeating the necessary operations in the following summer. Quince is an essential food-plant of *P. pyricola*, and though not suffering to any extent by its feeding, forms an important source from which pears are re-infested. Apple was fed upon by adults during the autumn migration, but immature stages were not observed on this tree.

MUNDINGER (F. G.). **Investigations on the Control of Pear Psylla.**—*New York State Agric. Expt. Sta.*, Bull. 529, 36 pp. Geneva, N.Y., July 1925. [Recd. February 1926.]

Data are given showing the results obtained from scheduled treatment with various dust and spray materials for the control of *Psylla pyricola*, Först., near Geneva, N.Y., in 1924. None of the dusts used appeared to control the pest in either the egg or early nymphal stages. Lime-sulphur 1 : 8 killed many eggs ; various sprays containing nicotine sulphate were very effective against the nymphs. Tobacco dust was apparently effective when added to the various sprays in combating the nymphs. The toxic effect of calcium cyanide dusts and nicotine dusts have been discussed elsewhere [*R.A.E.*, A, xiv, 73].

GLASGOW (H.). **Control of the Cabbage Maggot in the Seedbed.**—*N. Y. State Agric. Expt. Sta.*, Bull. 512, 112 pp., 13 pls., 1 fig., 22 refs. Geneva, N.Y., February 1925. [Recd. February 1926.]

These investigations were begun in 1920 and continued in each succeeding season. A number of methods for the control of *Phorbia* (*Hylemyia*) *brassicae*, Bch. (cabbage maggot) have been studied, the most reliable being cheesecloth screens, treatment with mercury bichloride, and tobacco dust. The tobacco dust is most expensive and under some conditions appears to favour the development of *Rhizoctonia* in seedbeds. It may, however, be safely used except during abnormal seasons or on plants that are specially subject to the disease.

FERRIS (G. F.). **Observations on the Chermidae (Hemiptera; Homoptera). Part iii.**—*Canad. Ent.*, lviii, no. 1, pp. 13–20, 5 figs. Orillia, Ont., January 1926.

In this further instalment of this work on PSYLLIDAE [*R.A.E.*, A, xiii, 235], the nymphal stages of the types of several genera are described with brief notes on the adults.

SLAGG (C. M.). **New and Unusual Diseases and Injuries of Tobacco.**—*Sci. Agric.*, vi, no. 6, pp. 193–198, 6 figs. Ottawa, Ont., February 1926.

During the summer of 1924 pupating individuals of *Papaipema nitela*, Gn., were found in the stems of tobacco, both in Quebec and Ontario. A burrow is excavated varying from one-half to the entire length of the stalk. Apparently the larvae enter at the base of the plant, the adults emerging at the top. The infested plants are stunted and lack vigour; sometimes the wind may break them off at the base.

NEEDHAM (J. G.). **Some New Ventures in Economic Entomology.**—*17th Ann. Rept. Quebec Soc. Prot. Plants, 1924–25*, pp. 9–13. Quebec, 1925. [Recd. March 1926.]

The author describes the rearing of larvae of *Muscina stabulans*, Fall., on fermented pulp derived from ground-up weeds, as food for young pheasants. He draws attention to the possibilities of utilising waste vegetable and other products for rearing insects for feeding insectivorous animals, and mentions two experiments in breeding Chironomids in this way, as food for fish.

LOCHHEAD (W.). **Applied Entomology in Russia.**—*17th Ann. Rept. Quebec Soc. Prot. Plants, 1924–25*, pp. 13–28. Quebec, 1925. [Recd. March 1926.]

This paper, which is based chiefly on accounts by N. N. Bogdanov-Kat'kov and Ī. Ī. Mamontov, describes the development of applied entomology in Russia and enumerates the various Russian entomological institutions, giving brief summaries of the history and most important investigations of each.

McLAINE (L. S.). **The Outbreak of the Gipsy Moth in Southern Quebec.**—*17th Ann. Rept. Quebec Soc. Prot. Plants, 1924–25*, pp. 32–34. Quebec, 1925. [Recd. March 1926.]

An account is given of the occurrence of the gipsy moth [*Porthetria dispar*, L.] in Southern Quebec in 1924 [*R.A.E.*, A, xiii, 581]. In order to prevent the possibility of the spread of the moth in the egg stage, the movement of Christmas trees and evergreens from certain areas has been prohibited. Experiments on the effect of low temperatures on exposed egg-clusters had indicated that *P. dispar* would not become a serious pest in Canada, but it is evident that reliance cannot be placed on these indications.

Petch (C. E.). **The Cranberry Rootworm Beetle** (*Rhabdopterus picipes*, **Oliv.**).—*17th Ann. Rept. Quebec Soc. Prot. Plants, 1924–25,* pp. 37–41, 2 pls., 13 refs. Quebec, 1925. [Recd. March 1926.]

Adults of the Eumolpid, *Rhabdopterus picipes*, Oliv. (cranberry rootworm beetle) were found seriously damaging the fruit and foliage of apple in Quebec in 1924. Injury to apple fruits by this beetle, which consists of shallow, irregular channels eaten out of the surface, has been reported from New York [*R.A.E.*, A, ix, 151], but this appears to be the first record of apple foliage being attacked. Descriptions of the life-history and stages are given, based on those of Scammell [*R.A.E.*, A, iii, 672]. The larva has been recorded only from the root of cranberry, but the adults attack various plants and have been found on alder in Canada. In Canada the insect occurs in Quebec and Ontario. Spraying with 1½ lb. powdered lead arsenate in 40 gals. Bordeaux mixture (4–4–40) had no effect on the beetles.

Hutchings (C. B.). **Two Important Insect Enemies of the Maple.**—*17th Ann. Rept. Quebec Soc. Prot. Plants, 1924–25,* pp. 42–45, 2 pls., 1 ref. Quebec, 1925. [Recd. March 1926.]

Two of the most important of the many insects injurious to the maple in Canada are the Cerambycid, *Glycobius* (*Plagionotus*) *speciosus*, Say (sugar-maple borer) and the Tineid, *Paraclemensia acerifoliella*, Fitch (maple leaf-cutter). *G. speciosus* occurs in sugar maples [*Acer saccharum*] throughout Quebec and Ontario and sometimes infests as many as 60 per cent. of the trees in a plantation [*cf. R.A.E.*, A, x, 578]. The eggs are laid on the trunks of the trees in the latter part of July and August. The larvae, on hatching, penetrate into the bark, where they pass the winter; in the following spring they begin mining under the bark, making large tunnels over which the bark dies. The tunnels may be over 2 feet in length and ¾-inch wide at the end, and sometimes, especially if two intersect, completely girdle the tree, causing it to die. As a control measure the young larvae should be cut out of the bark before they have penetrated through it. It is probable that thick undergrowth affords some protection from *G. speciosus*, as the adults like sunshine and the base of a tree is a favourite place for oviposition. Thick undergrowth is thought to be the cause of low infestation in one plantation examined.

P. acerifoliella was exceedingly abundant in Quebec and Ontario in 1924 [*R.A.E.*, A, xiii, 576]. The life-history is briefly described [*R.A.E.*, A, x, 531]. Spraying with lead arsenate, 1½ lb. to 40 gals. water, and collecting and burning leaves and rubbish from under the trees in late autumn or at the end of April are recommended as control measures.

Petch (C. E.) & Armstrong (T.). **Insects of the Season in Southern Quebec for the Year 1924.**—*17th Ann. Rept. Quebec Soc. Prot. Plants, 1924–25,* pp. 72–77. Quebec, 1925. [Recd. March 1926.]

In this paper notes on the prevalence and biology of a number of injurious insects in southern Quebec are given. *Tychius picirostris*, F. (clover head weevil) was abundant on red clover in one locality, causing the heads to wither. *Rhagoletis pomonella*, Walsh (apple maggot) appeared unusually early and caused complete loss of the crop in some orchards where control measures were not carried out. Spraying against this pest usually coincides with the hatching of the eggs of *Hyphantria cunea*, Dru. (fall webworm), and thus controls both. Minor pests of apple included *Coleophora* (*Haplotilia*) *fletcherella*, Fern. (cigar case-bearer), *Ceresa bubalus*, F. (buffalo tree-hopper), which scars the bark of young trees, lowering their vitality and often killing them, and *Marmara* (*Gracilaria*) *elotella*, Busck (apple-tree bark-miner), which mines the bark of young trees. Elms in several places were severely attacked by *Kaliofenusa ulmi*, Sundewall (elm leaf-miner); and infestation of sunflowers by *Straussia longipennis*, Wied. (peacock fly) in some districts has been so severe as to lead to the abandonment of the growing of the crop. *Tinea pellionella*, L. (case-making clothes-moth) is common in many parts of Quebec, and damages clothing and other household goods, causing far more serious loss than is generally realised.

VENABLES (E. P.). **Pansy Spots on Apples (a Peculiar Form of Thrips Injury).**—*Proc. Ent. Soc. British Columbia, 1925*, no. 22, pp. 9–12. [Victoria, B.C.] 1925. [Recd. March 1926.]

Apples in the north-western United States and also in British Columbia are frequently marked by discoloured spots known as pansy spot because they resemble the markings of the flower. The blemish is confined to the outer skin of the fruit, the inner tissues remaining undamaged. Examination of blossoms and fruit revealed the presence of many thrips eggs, both in the pistils of the blossoms and in the spots on the fruit. Those on the fruit lie in small cavities with the end of the eggs flush with the surface. Larvae were first found in the calyx of crab-apples on 20th May and in a day or two were numerous; from one to six were found in a single calyx, which is evidently an ideal spot for feeding and concealment during the early development of the insect. As soon as the petals fall and the essential organs begin to dry, the thrips leave the calyx and migrate to neighbouring weeds and leguminous plants. A few may be found during the summer in the tender, unfolding leaves of the terminal growth of apple trees. Tumbling mustard [*Sisymbrium altissimum*] is a favourite food-plant during early June, eggs occurring within the blossom stalks; lucerne also serves as a food-plant during summer, and reproduction is known to take place on it. Thrips are also found within the blossoms of plums and prunes, although no definite injury to these fruits has been noticed. The spotting produced on the fruit by oviposition will sometimes persist until picking time on certain varieties of apples, though others outgrow the injury by the autumn. Typical pansy spots also occur on grapes and tomatos. Extensive collections of thrips from apple bloom have shown that *Frankliniella occidentalis*, Perg., is by far the most prevalent species, and there is little doubt that it causes the injury in question. *Aeolothrips fasciatus*, L., and *A. conjunctus*, Perg., have also been taken from apple bloom, as has an unidentified species of *Taeniothrips*, which is less common. These species probably have no connection with the injury, and they may be predacious upon *F. occidentalis*. Standard sprays for thrips, applied during the pink stage, would undoubtedly help to reduce the injury.

Glendenning (R.). **The Lecanium Scale Outbreak in Vancouver, B.C.**—*Proc. Ent. Soc. British Columbia, 1925*, no. 22, pp. 21–26, 4 figs. [Victoria, B.C.] 1925. [Recd. March 1926.]

Serious injury to maple trees in Vancouver, causing the leaves to shrivel and drop prematurely, was found to be due to infestation by the Coccid, *Lecanium capreae*, L. (considered by some authors to be synonymous with *L. coryli*, L.), which was probably introduced on shade trees from England in 1903, and has increased enormously in the apparent absence of any natural parasite. A variety of food-plants are attacked, of which horse-chestnut, and broad-leaved and vine maples (*Acer macrophyllum* and *A. circinatum*) are the favourites. In the autumn of 1924 it was found that practically all the shade-trees lining some 25 miles of boulevards in the west end of Vancouver, as well as maple trees in parks, were badly infested. The insect passes the winter in an immature stage on the twigs and smaller branches. The females are full grown by the second week in May ; the males emerge from their pseudo-pupal stage at this time, and mating occurs. The eggs from these females hatch during late June, July and August, and the young scales crawl freely to the underside of the leaves where they feed until the leaves begin to turn in September, when they migrate to the twigs or branches for the winter.

As the trees were high, a solid stream spray pump of 25 h.p. was obtained, and two proprietary oil emulsions at 8, 10, and 12½ per cent. strength were tried and proved very effective, giving well over 90 per cent. mortality ; at 5 per cent. strength only 40 per cent. mortality occurred. The spray was equally effective when applied in December or up to the end of March (when the buds begin to burst), but the dormant strength should not be used later than this. An average of 4 to 6 gals. of spray per tree was used, the difficulty being to cover the tree completely without undue waste or harmful amounts of oil running down the trunks. A summer spray of nicotine sulphate and fish-oil soap at standard strength was quite successful in killing newly-hatched scales and should be applied during the first week of September.

Downes (W.). **The Poplar Sawfly** (*Trichiocampus viminalis*, **Fallén**).—*Proc. Ent. Soc. British Columbia, 1925*, no. 22, pp. 26–32, 2 figs., 5 refs. [Victoria, B.C.] 1925. [Recd. March 1926.]

Lombardy poplars (*Populus nigra italica*) in all parts of Victoria, B.C., have in recent years been defoliated by caterpillars of the sawfly, *Trichiocampus viminalis*, Fall., which attacks many kinds of poplar. There seems to be only one generation a year in British Columbia, though two have been found in New York. Oviposition begins in early June, and the first larvae hatch towards the end of the month and feed for 35 to 40 days. They make cocoons in the ground or in spaces and cracks among stones, crevices of trees, etc. They may remain in the pre-pupal state for two years, but generally after one winter in this condition a short pupal stage occurs in late spring or midsummer. The young larvae are killed off in numbers by bacteria resembling *Coccobacillus acridiorum* ; very few other natural enemies occur. Larvae were easily killed by spraying with 1 lb. lead arsenate powder to 40 gals. water. This kills all young larvae within about 3 days, while the older ones disappear soon after. Infestation usually begins among the lower branches and gradually spreads upward, and it is suggested that if prompt measures are taken, it might only be necessary to spray the lower parts of the tree.

Ruhmann (M. H.). **The Control of the Oystershell Scale with Oil Sprays.**—*Proc. Ent. Soc. British Columbia, 1925*, no. 22, pp. 33–35. [Victoria, B.C.] 1925. [Recd. March 1926.]

In the semi-arid conditions of the interior of British Columbia, the usual dormant application of lime-sulphur for the control of the oyster-shell scale [*Lepidosaphes ulmi*, L.] is ineffective, even when used at a strength of 1 : 7. Summer sprays of lime-sulphur 1 : 30 or nicotine sulphate 1 : 1,200 gave good results when applied just as the eggs were hatching, but the correct time of application proved a difficulty in general practice, so that many growers failed to obtain success. Oil emulsions were then tried. Commercial miscible oil, applied at 10 per cent. strength, destroyed all eggs within 6 days, and wherever perfect contact was obtained, gave 100 per cent. control. An application of 10 per cent. fuel oil, with 10 lb. fish-oil soap to each 100 gals., resulted in 87 per cent. of the eggs being killed by hatching time, while many larvae were found dead; the miscible oil caused a slight check in bud development, but with the other spray bud development was normal. Whether a uniform standard can be maintained in these oils, and whether they can always be used without injury to trees, can only be determined by experiments over a number of years.

Glendenning (R.). **Additions to the List of Aphididae of British Columbia.**—*Proc. Ent. Soc. British Columbia, 1925*, no. 22, pp. 36–38. [Victoria, B.C.] 1925. [Recd. March 1926.]

As a result of the examination of fresh material collected during 1921–23, 17 further species of Aphids from British Columbia are added to those already enumerated [*R.A.E.*, A, xii, 487], with notes on the food-plants.

Molinary Sales (E.). **Como hemos combatido el gusano agrimensor de la caña en Humacao.** [How we combated *Remigia punctularis* attacking Sugar-cane at Humacao.]—*Rev. Agric. Puerto Rico*, xvi, no. 1, pp. 9–11. S. Juan, P.R., January 1926.

As in a similar case [*R.A.E.*, A, xiii, 136] an infestation of sugar-cane by *Remigia punctularis*, Hb. (*repanda*, auct.) was checked by dusting with a mixture of 3 parts of slaked lime and 1 of lead arsenate.

Urich (F. W.). **The Cacao Beetle.**—*Bull. Dept. Agric. Trinidad & Tobago*, xxi, pt. 1, pp. 36–39, 3 pls. Port-of-Spain, 1925. [Recd. March 1926.]

The cacao beetle [*Stirastoma depressum*, L.] is a serious pest of cacao in Trinidad, especially in the southern part of the island; it has not yet been recorded from Tobago. It is particularly injurious to young trees, often killing them or rendering them incapable of producing a remunerative crop. The adults eat the bark of the young twigs of cacao, wild chataigne [*Pachira aquatica*], silk cotton [*Eriodendron*], *Malachra* and *Hibiscus*, and the eggs are laid on any of these plants, but chiefly on the first two. Sickly or damaged trees are preferred for oviposition, and in the case of cacao, young trees. The eggs are laid singly in cavities made in the bark, chiefly on the collars and forks, or, in older trees, on the small branches. The larvae hatch in 5 days and tunnel under the bark, eating the cambium, for 75 days. A pupal chamber is constructed in the woody part of the stem, and the pupal stage lasts 12 days. Thus the complete life-cycle occupies about 3 months, and there may be 4 generations a year. The adults, however, live for 3 months or more, and egg-laying takes place chiefly in the dry seasons, so that there are two main broods a year. In captivity one female laid 170 eggs in 62 days, but more would probably be laid under natural conditions. The adults chiefly frequent sunny trees, and ground shading therefore gives considerable protection to young trees. Older trees can be sufficiently shaded by their own foliage, if carefully pruned. The adults are preyed upon by several birds, and the larvae are subject to the attacks of Hymenopterous parasites, and also die in considerable numbers if their burrows become saturated in wet weather. The adults may be collected by hand from the trees, and from heaps of pods and prunings. They may also be captured on traps consisting of branches of wild chataigne placed against cacao trees in open places ; these branches should be buried when they cease to be attractive, so as to destroy any larvae in them. Larvae and pupae should be cut out of the trees, and the wounds thus caused should be dressed with crude oil or a repellent. The adults may be killed by spraying or painting the trees on which they feed with 5 lb. lead arsenate paste in 50 gals. water, to which 10 lb. slaked lime may be added to give a thicker consistency. As repellents to oviposition one of the following may be painted on the trees : Road oil ; tar ; slaked lime, 1 lb., lead arsenate paste, 2 oz., water 2½ gals. ; or clay and soap wash, in which ½ lb. of soap and enough clay to make a thick paste take the place of slaked lime in the last formula. Trees should be painted or sprayed in the dry seasons, and larvae should be removed first. Dead branches should be burnt. Good cultivation renders the trees more resistant to attack by the beetles.

URICH (F. W.). **The Plantain Weevil.**—*Bull. Dept. Agric. Trinidad & Tobago*, xxi, pt. 1, pp. 40–42, 1 pl. Port-of-Spain, 1925. [Recd. March 1926.]

The weevil, *Cosmopolites sordidus*, Germ., attacks all species of Musaceae in Trinidad, and is particularly injurious to plantains, which it has completely destroyed in some localities. Bananas grown in good soil or well cultivated are not seriously injured, and certain varieties are more or less resistant. The eggs are laid low down between the leaf-sheaths, in the stem, or in the bulb, in small cavities prepared for them. The larvae hatch in 5–7 days, and are active for 15–20 days, tunnelling in the rootstock. Pupation takes place in a small chamber in the bulb without a cocoon being made, and the adults emerge 5–8 days later, the whole life-cycle occupying 25–35 days. Reproduction is continuous throughout the year. The adults are gregarious, congregating in dark cavities in the banana stems and in the bulbs ; they are able to fly and have been taken flying against the wind a mile or more from any banana plantations; they live for several months.

Points of distinction between *C. sordidus* and another weevil-borer [*Metamasius sericeus*, Oliv.], which is also figured, are given. The latter occurs mostly in stems in a state of fermentation due to fungous disease, and well above the ground; its pupa is enclosed in a cocoon made of the fibres of the plant. Control measures for *C. sordidus* include propagation from unattacked suckers, which should be submerged in water for 48 hours before planting to destroy any larvae that may have been overlooked; destruction of infested stools, which should be cut into small pieces and burnt or buried; and the use of traps, consisting of slices of stems or bulbs of banana placed between the rows, from which the weevils should be collected daily.

GOMEZ (C. A.). **[The Pink Bollworm of Cotton in Montserrat.]**—*Trop. Agriculture*, iii, no. 2, p. 23. St. Augustine, Trinidad, February 1926.

During 1925 the percentage of cotton bolls attacked by *Platyedra gossypiella* (pink bollworm) in Montserrat increased from 7 in June to 98 in October. Early in the season it is usual to find only a single larva in each boll, but at the end of the season there may be as many as 8 in each. The loss in cotton lint at the beginning of the season is therefore very small, while at the end it is almost total. The loss of cotton in Montserrat caused by *P. gossypiella* is estimated at about £10,000 a year, being about 25 per cent. of the total crop. The importance of early planting, and of early and thorough cleaning up of the old plants in the fields is emphasised.

ALFARO (J.). **A New Method of Fighting the Propagation of Mosaic Disease in Sugar Cane.**—*Proc. Agric. Soc. Trinidad & Tobago*, xxv (1925), pt. 11, pp. 437–439. Port-of-Spain. [1926.]

One of the difficulties in selecting sugar-cane free from mosaic disease for propagation is that the disease may be present, but not visible; consequently cuttings from apparently healthy plants may be actually diseased. In experiments made in Cuba, the author found that cane planted in autumn was resistant to attacks by the insect vectors of mosaic by the time that the latter had become active in the following spring. Therefore, by taking cuttings in the autumn from canes that had been planted the previous autumn and not cut in the spring, he obtained healthy canes, which were resistant to attacks by the insect vectors of mosaic disease because by the time that these were active, in the following spring, they were too strong for them to feed on. Plants obtained at the same time from cuttings taken from canes cut in the spring were in the following spring resistant to insect attack, but 7·3 per cent. of these developed mosaic disease, which had been latent at the time of propagation, but had doubtless been acquired in the previous spring, when the young shoots came up after the cutting. It appears that transmission of mosaic disease through insects is more serious than through seed cane; and that infection can be avoided by planting cane in the autumn, when the insects are in the egg stage, and by using for propagation only cane that has been uncut since the previous autumn.

Kopp (A.). **Les méthodes biologiques dans la lutte contre les Insectes ravageurs.**—*Jl. Sta. agron. Guadeloupe,* v, nos. 2–3, pp. 65–69 & 156–164. Point-à-Pitre, 1925. [Recd. February 1926.]

The work of various authors on the control of insect pests by means of their natural enemies, such as insect parasites and predators, fungi and bacterial diseases, is reviewed. The importance and value of such methods is admitted, provided that they are applied with great discrimination.

Hucke (O.). **Expurgo de saccaria em São Paulo contra a broca do café. Posto de expurgo No. 2.** [The Disinfection of Coffee Bags in São Paulo against the Coffee-borer. Disinfestation Station no. 2.]—*Comm. Estudo e Debellação da Praga Caféeira,* Publ. no. 14, 11 pp., 8 pls. S. Paulo, 1925. [Recd. February 1926.]

In Brazil the bags in which coffee has been delivered to the warehouses are returned empty to the plantations, which do not necessarily receive the same ones that they actually sent out. This practice tends to disseminate the coffee-berry borer, *Stephanoderes hampei,* Ferr. Disinfestation stations have therefore been established where the bags are fumigated with carbon bisulphide. This paper describes the station at S. Paulo, where 3,249,600 bags were dealt with between August 1924 and November 1925. Details are given of the method of handling the bags, but not of the actual fumigation [*R.A.E.*, A, xiii, 232].

von Ihering (H.). **Der brasilianische Kaffee und seine Schädlinge.** [Brazilian Coffee and its Pests.]—*Lateinamerika,* 1925 (Ausg. B). (Abstract in *Der Tropenpflanzer,* xxix, no. 2, pp. 78–79. Berlin, February 1926.)

Out of a world production of some twenty million bags of coffee, Brazil supplies fourteen millions, and of these ten come from the State of S. Paulo. The chief pest of coffee is the berry borer, *Stephanoderes hampei,* Ferr. (*coffeae,* Hag.), but in a country like Brazil, where nearly 70 per cent. of the population are illiterate, there are great difficulties in the application of rational measures against it. Coffee bushes are also infested with the leaf-cutting ant, *Atta sexdens,* L., which is destroyed by pouring carbon bisulphide into the nests and then setting it alight. The use of another ant, *Prenolepis fulva,* Mayr, against *A. sexdens* cannot always be relied on.

Argollo Ferrão (V. A.). **A Formiga Sauva.** [*Atta sexdens.*]—*Correio-agric.,* iii, no. 12, p. 325. Bahia, December 1925.

The leaf-cutting ant, *Atta sexdens,* is one of the chief pests of agriculture in Brazil. The author has imported cultures of *Botrytis bassiana* and *Isaria densa* with a view to ascertain whether these fungi are likely to check this pest, against which no really effective measure exists.

BONDAR (G.). *Conotrachelus mammillatus* **Boh., bicho dos sapotis.** [*C. mammillatus*, the Sapodilla Grub.]—*Correio-agric.*, iii, no. 12, pp. 332–334, 2 figs. Bahia, December 1925.

The weevil, *Conotrachelus mammillatus*, Boh., causes severe injury o the sapodilla plum, *Achras sapota*, in Brazil, but does not spread eadily and is often confined to a single tree for several generations. Fruits at all stages of growth are attacked, the female laying one or nore eggs in the pulp. The resulting wound is usually revealed by a drop of white liquid that coagulates. The larva enters the seeds and feeds there. Young fruits either fall or fail to develop, and half-grown ones are distorted. The pulp also is sometimes eaten, usually in the case of ripe fruits. The larval stage lasts 20–30 days. After the fruit has fallen the larva emerges and pupates in the ground at a depth of 1–3 inches. Sometimes pupation occurs in the fallen fruit, usually in the seed. In May and June the pupal stage occupies 20–25 days, and in July and August it may last 2 months or more. As the sapodilla fruits in Bahia nearly all the year, the weevil can breed continuously. A brief description of the larva and adult is given.

All infested or fallen fruits should be collected daily and burnt or thrown into boiling water. If a fruit falls in the night, the larva has time to enter the soil, and the surface of the ground must therefore be worked weekly to expose the larvae and pupae to weather and natural enemies. If these measures are carried on for 2 or 3 years, the weevil nay be reduced to negligible numbers.

El cultivo del manzano en las Islas del Delta. [Apple Cultivation on the Islands of the Delta of the Parana.]—*Gaceta rural*, xix, no. 222, pp. 545–553, 8 figs. Buenos Aires, January 1926.

The chief pests of the apple occurring on the islands of the delta of the Parana river are *Aspidiotus perniciosus*, *Cydia pomonella* and *Eriosoma lanigerum*.

EHRHORN (E. M.). **Report of the Division of Plant Inspection for the Biennium of 1921-22 and 1923-24.**—*Hawaii: Repts. Bd. Agric. & Forestry 1921–22 & 1923–24*, pp. 69–80 & 36–44, 5 & 3 pls. Honolulu, 1923 & 1925. [Recd. February 1926.]

These accounts of the plant inspection work during the periods under review include lists of pests intercepted, most of which have already been noticed from the monthly reports.

FULLAWAY (D. T.). **Report of the Entomologist.**—*Hawaii: Rept. Bd. Agric. & Forestry 1923–24*, pp. 29–35, 3 pls. Honolulu, 1925. [Recd. February 1926.]

Some of this work on the propagation and distribution of beneficial nsects has already been noticed [*R.A.E.*, A, xiii, 19, 174]. Other nsects liberated were *Ischiogonus syagrii*, a parasite of the fern weevil [*Syagrius fulvitarsis*]; *Pteromalus puparum*, a parasite of the cabbage butterfly [*Pieris rapae*]; *Pseudaphycus utilis*, a parasite of *Pseudococcus nipae*; *Coelaspidia osborni*, a parasite of *P. brevipes* (*bromeliae*, auct.); *Hyperaspis silvestrii*, *H. albicollis*, *Curinus coeruleus*, *Diomus* *margipallens*, *Scymnus pictus*, *Pullus uncinatus*, and *Cleothera bromelicola*, predacious on mealybugs ; and *Euplectrus platyhypenae*, a parasite of the army-worm [*Cirphis unipuncta*]. A South African Coccinellid, *Exochomus nigromaculatus*, has been received from Southern California and is now being propagated and distributed.

Pope (W. T.). **The Guatemalan Avocado in Hawaii.**—*Hawaii Agric. Expt. Sta., Honolulu*, Bull. 51, 24 pp., 10 pls. Washington, D.C., 16th August 1924. [Recd. February 1926.]

The fruit of the Guatemalan race of the avocado has an unusually thick rind, which protects it from the attacks of the fruit-fly, *Ceratitis capitata*. The insect pests of this tree in Hawaii are *Pseudococcus nipae*, *Xyleborus immaturus* and the larvae of the Tortricid, *Amorbia emigratella*, the latter occurring particularly on young trees. Kerosene emulsion is recommended for the control of the mealybug, the formula being ½ lb. common laundry soap, 2 U.S. gals. kerosene, and 1 U.S. gal. water, applied at the rate of 1 part of stock solution to 15 of water.

An emulsion of carbolic acid and soap proved an effective repellent for *X. immaturus*. As soon as there is any evidence of the presence of *A. emigratella*, the trees should be sprayed with lead arsenate, 1 oz. paste to 1 U.S. gal. water.

Whitney (L. A.). **Reports of the Acting Chief Plant Inspector, August-September 1925.**—*Hawaiian Forester & Agric.*, xxii, no. 4, pp. 136–138. Honolulu, October-December 1925.

The pests intercepted during the period under review included : From California, *Pseudococcus maritimus* on deciduous fruit ; from Pennsylvania, a scale on *Kentia belmoreana* ; from Texas, *Cydia* (*Carpocapsa*) *saltitans* on *Euphorbia* sp. ; from Fiji, *Rhabdocnemis obscura* and *Diatraea* sp. on sugar-cane ; from Japan, *Pseudaonidia trilobitiformis*, *Coccus* (*Lecanium*) *hesperidum*, and *Aulacaspis pentagona*, among various plants ; from China, *P. trilobitiformis* on *Citrus* fruit ; from Samoa, a mealybug on yams ; and from the Philippines, the ant, *Monomorium pharaonis*, amongst clothing.

Ehrhorn (E. M.). **Report of the Chief Plant Inspector, October 1925.**—*Hawaiian Forester & Agric.*, xxii, no. 4, pp. 138–139. Honolulu, October–December 1925.

The pests intercepted during October included : From California, *Pseudococcus adonidum* (*longispinus*) on deciduous fruit, and *Heliothis obsoleta* (*armigera*) on tomato ; and from Japan, Coccids and Lepidopterous larvae on *Citrus* plants in soil.

Balachowsky (A.). **Note sur une Cochenille nouvelle vivant sur** *Erica arborea* **en Algérie.**—*Bull. Soc. ent. France*, 1925, no. 19, pp. 317–320, 5 figs., 3 refs. Paris, 1925. [Recd. February 1926.]

Ripersia delassusi, sp. n., is described from *Erica arborea* in Algeria.

de la Escalera (M.). **Noticia biológica sobre** *Lymantria dispar.*—*Bol. R. Soc. española Hist. nat.*, xxv, no. 7, pp. 337–340. Madrid, 25th September 1925.

An account is given of the transportation to Algeria of Coleopterous predators and Hymenopterous parasites of *Porthetria* (*Lymantria*) *dispar*, L., from Spain, including the Silphid, *Xylodrepa quadripunctata*, the Carabids, *Calosoma inquisitor* and *C. sycophanta*, and many cocoons of *Apanteles*.

Mercet (R. G.). **La polilla de la patata.**—*Bol. R. Soc. española Hist. nat.*, xxv, no. 9, pp. 469–476, 4 figs., 10 refs. Madrid, 30th November 1925.

Phthorimaea operculella, Zell. (potato tuber moth), which has been present in Spain for a number of years without receiving much attention, is increasing so rapidly in the eastern part of the country and causing so much damage that the potato-growing industry will suffer serious losses unless measures are taken to limit its activities. The morphology and biology of the moth are described, and the usual preventive and remedial measures are explained, including the use of poultry in store-houses, covering stored potatoes with a layer of sand, and uprooting and burning infested potatoes and keeping down wild solanaceous plants in the field.

Sánchez y Sánchez (M.). **Un metodo muy sencillo para cultivar en el laboratorio la filoxera** (*Peritymba vitifoliae*) **de la vid.**—*Bol. R. Soc. española Hist. nat.*, xxv, no. 5, pp. 264–265. Madrid, 28th May 1925.

Attempts to rear *Phylloxera* (*Peritymba*) *vitifoliae* on plants other than vine have been tried without success. The author describes a simple method of rearing the insect in the laboratory for investigation purposes. In the spring, when the infested vines show their greatest vitality, the cortex of the small roots with galls can easily be separated by ringing round the peripheral region and then quickly drawing out the central portion so that a hollow cylinder remains. The cylinders are then washed in distilled water and immersed in alcohol for half an hour and again washed. They are then placed in a glass vessel and the parthenogenetic females of *P. vitifoliae* placed on the outside of them by means of a dissecting needle. Sterilised sand is then arranged around these dead rootlets in imitation of natural conditions. For feeding the insects, sap is drawn from the vascular tissue of a vine shoot by means of a pipette with a rubber bulb and is inserted into the interior of the hollow root. It fills the hollow and penetrates the cortical cells so that the insects by puncturing the epidermis can feed in the normal way and are available for experimental purposes. Condensed sap can be obtained and kept to feed several generations.

de Mora (R. F.). **Insectos que causan grave daño al naranjo.** [Insects causing severe Harm to the Orange.]—*Bol. Agric. téc. y econ.*, Sec. doctrinal, xviii, no. 205, pp. 5–21, 17 figs. Madrid, 31st January 1926.

Serious injury is caused to oranges in Spain by the Coccids, *Lepidosaphes beckii*, Newm. (*Mytilaspis citricola*, Pack.), *L.* (*M.*) *gloveri*, Pack., *Chrysomphalus dictyospermi* var. *pinnulifera*, Mask., *Pseudococcus citri*, Risso (which is aided by the ant, *Iridomyrmex humilis*, Mayr), *Parlatoria zizyphus*, Lucas, *Coccus* (*Lecanium*) *hesperidum*, L., *Icerya purchasi*, Mask., and *Ceroplastes sinensis*, Del G., and by the Aphid, *Toxoptera* (*Aphis*) *aurantii*, Boy. Brief notes on the biology and control of each of these are given.

LE MARCHAND (S.). **Note rectificative à propos du** *Gracilaria* **des Azalées (Lep.).**—*Bull. Soc. ent. France*, 1925, no. 20, pp. 335–338. Paris, 1925. [Recd. February 1926.]

It is stated that the correct name of the moth recently recorded from *Azalea indica* in France [*R.A.E.*, A, xiii, 444] should be *Gracilaria azaleella*, Brants, and not *G. zachrysa*, Meyr. The history of the confusion between these two species is discussed, and the characters distinguishing them are described.

FEYTAUD (J.). **La défense contre la cochylis et l'eudémis.**—*Rev. Zool. agric. & appl.*, xxiv, nos. 9–10, pp. 182–192 & 197–210, 1 pl., 14 figs., 18 refs. Bordeaux, September & October 1925. [Recd. March 1926.]

The various methods that have been devised for the capture of adults of the vine moths [*Polychrosis botrana*, Schiff., and *Clysia ambiguella*, Hb.] are reviewed. These include screens covered with sticky substances, and light and bait traps.

FEYTAUD (J.). **Sur les ravages causés par un Symphyle,** *Scutigerella immaculata* **Newport.**—*Rev. Zool. agric. & appl.*, xxiv, no. 9, pp. 192–193. Bordeaux, September 1925. [Recd. March 1926.]

Maize in the region of Landes, France, has been found to be greatly damaged owing to the presence of numbers of the Myriapod, *Scutigerella immaculata*, Newport, which feeds on the small roots and root fibres. The use of farm manure increases its abundance, and in places it becomes impossible to grow maize, while beans, beets, etc., are also attacked. This is apparently the first time that this damage has been reported from France, though this Myriapod is known to be injurious to crops in Guernsey and in America.

FRON (G.). **L'anguillule de l'avoine.**—*Jl. Agric. prat.*, xlv, no. 7, p. 132. Paris, 13th February 1926.

Damage to oats by the Nematode, *Tylenchus dipsaci* (*devastatrix*), has been reported from several localities. For infested plants nothing can be done, but rye, which is one of the favourite food-plants, might be sown on badly infested areas as a trap-crop, and the young plants on being pulled up would take a large number of the Nematodes with them and could then be destroyed by fire or quick lime. If this were done several times in a season, the ground should be entirely cleared of them. Barley or leguminous crops, which are not susceptible, might be sown after deep cultivation to bury the Nematodes. Disinfection of the soil by carbon bisulphide is expensive and not always satisfactory.

LE MARCHAND (S.). **Les** *Lithocolletis.—Amateur de Papillons*, ii, nos. 15 & 16, pp. 237–240 & 247–251. Paris, May–June 1925.

A general account is given of the life-history of the leaf-mining moths of the genus *Lithocolletis*, which have at least two generations a year in France. The duration of the different stages and the time of their appearance in Normandy are given. A list is appended of the species of this genus that occur in France, together with their food-plants and indications as to whether the upper or lower surface of the leaf is mined.

MANEVAL (M. H.). **Multiplication anormale d'***Orphania denticauda*, **Charpentier.**—*Bull. bi-mens. Soc. Linn.*, v, no. 3, pp. 20–23. Lyons, 5th February 1926.

In August 1925 an outbreak of *Orphania denticauda*, Charp., occurred near Chabannerie (Haute-Loire). The insects occupied an area of about 2½ acres on a natural meadow ; they were distributed very densely, about 100 individuals to the square metre, but did not display any gregariousness. The great majority of individuals were heavily marked with brown and only few specimens of the ordinary green colour were found. The grass was severely damaged by these Orthoptera, which were destroyed by mowing.

SHERRARD (O.). **The Winter Spraying of Fruit Trees. Tests with the New Tar-oil Washes.**—*[Ireland :] Dept. Lands & Agric. Jl.*, xxv, no. 3, pp. 297–304, 1 ref. Dublin, 1926.

The value of winter spraying of fruit trees for the destruction of those pests that pass the winter on the bark and twigs in the egg stage is discussed. Until recently the materials chiefly used for this purpose were caustic soda, lime, lime-sulphur, and copper sulphate ; all of these remove moss and lichen, and the last two are fungicides, but only lime has any ovicidal action, and that is but partly effective. In laboratory and field experiments with a proprietary tar-oil wash at strengths of 7½ and 9 per cent. almost complete control was obtained over the eggs of *Psylla mali*, Schmidb. (apple-sucker), while control trees were severely attacked, both by *P. mali* and by Aphids, which latter did not appear on the sprayed trees. Lime-wash gave good control in the laboratory, but failed in the open, probably owing to the rough bark preventing the eggs from being properly covered. The tar-oil wash also removed all moss and lichen. In the following year the control trees and those that had been sprayed were all sprayed with tar-oil wash, but only those that had been sprayed the previous year bore good crops, thus demonstrating that damage by *P. mali* and Aphids is not limited in its effects to the year in which the attack takes place. Tests on a small scale to determine the strength of tar-oil required for an effective spray against the eggs of *P. mali* and Aphids on apple showed that a 9 or 10 per cent. spray gave 100 per cent. control ; 7 or 5 per cent. spray 98 per cent. control ; 4 per cent. spray 94 per cent. control over Aphids, 80 per cent. control over *P. mali* ; 3 per cent. spray 90 and 70 per cent. control respectively. In the same season a 5 per cent. tar-oil spray (2 gals. tar-oil to 38 gals. water) gave excellent results in an apple orchard in which unsprayed trees were badly infested by *P. mali* and Aphids. A 5 per cent. tar-oil spray was found to be an efficient control for eggs of red spider [*Bryobia*] on gooseberry. A 10 per cent. spray gave complete control, but delayed the opening of the buds, without, however, injuring them. Caustic soda and nicotine, lime-sulphur and calcium caseinate, and Woburn wash (paraffin emulsion with 2 per cent. caustic soda), tested at the same time, were quite ineffective against the eggs of this mite.

Anuraphis helichrysi, Kalt. (*Aphis pruni*, auct.)(plum leaf-curling aphis) usually passes the winter in the egg stage, but near Dublin adults were found on damson trees at the end of November and in January and February ; those found in the latter months were feeding on the dormant buds. A 5 per cent. tar-oil spray, applied in February, killed both eggs and adults of this Aphid, the trees remaining almost free from infestation throughout the spring and summer. Other damson trees sprayed at the same time with paraffin emulsion and with Woburn wash, and control trees, all suffered from a very severe attack by this Aphid. The Woburn wash killed the majority of the adult Aphids on the trees at the time of the spraying, but evidently did not kill the eggs. Apple trees badly infested with *Lepidosaphes ulmi*, L. (*Mytilaspis pomorum*, Bch.) (mussel scale) were sprayed in February, some with 10 per cent. tar-oil, some with 7½ per cent. tar-oil, and some with Woburn wash ; when examined in June, by which time large numbers of *L. ulmi* had hatched on a control tree, none had hatched on the trees sprayed with 10 per cent. tar-oil, but some were found on the trees treated with the other two sprays. Tar-oil sprays did not control apple scab fungus [*Venturia inaequalis*].

No injury to trees as a result of spraying with tar-oil was observed at any time. Tar-oil sprays should be applied only in winter, but not during frost. The spray should not be allowed to freeze in the barrel. It is injurious to cabbages or other green vegetables. In grass orchards poultry and stock should be excluded for about a fortnight after spraying.

DONISTHORPE (H.). **Marriage (?) Flight of ♂♂ of** *Pseudococcus gahani* **Green.**—*Ent. Mo. Mag.*, lxii, pp. 59–60. London, March 1926.

An unusual number of male Coccids, *Pseudococcus gahani*, Green, in October 1925, is recorded near London. This Coccid has occurred in the neighbourhood on laburnum and acacia [*Robinia*].

FOX-WILSON (G.). **Tetrachlorethane as a Glasshouse Fumigant.**—*Gard. Chron.*, lxxix, no. 2043, p. 138, 4 refs. London, 20th February 1926.

Tetrachlorethane is not highly toxic to man and may therefore be used in conservatories opening into rooms and in small greenhouses, where the measurement of a small quantity of sodium cyanide or potassium cyanide is difficult. To destroy greenhouse whiteflies [*Trialeurodes vaporariorum*], the fumigant is poured along the central path and the house closed for at least 12 hours, 5–10 fl. ozs. of tetrachlorethane being sufficient for 1,000 cu. ft. of space. Two or three successive fumigations are essential as the gas is not toxic to the ova, and the minimum dose is often insufficient to kill all the nymphs. The interval between fumigations varies from three weeks in the early spring and late autumn to ten days in summer. The temperature should be between 65° and 70° F., which allows for a regular evaporation and diffusion of the gas.

Although this gas is highly toxic to the nymphal and adult stages of whiteflies, it has little effect on Aphids, scale-insects or mites. Lists are given of plants that may be fumigated with safety and of those that are liable to damage by the gas.

MILES (H. W.). **Observations on Wireworms and their Control in England with Cyanogas Calcium Cyanide.**—*Res. Devpmt. Cyanogas Calcium Cyanide*, Sect. 5, pp. 18–34, 4 figs., 8 tables. New York, N.Y., The American Cyanamid Co., 1926.

Experiments made in Lincolnshire with Cyanogas calcium cyanide in granular form for the control of wireworms confirm previous results as to the effectiveness of this method [*R.A.E.*, A, xii, 581 ; xiii, 627]. The wireworms concerned were *Agriotes* spp., *A. obscurus* being common in the district.

The best results are obtained by the prebaiting method [*R.A.E.*, A, xiii, 627], the baits being set at a depth of 3 inches. The calcium cyanide should be drilled into the ground about fourteen days later (when digging between the rows does not disclose any appreciable number of wireworms) at the rate of 6 lb. per 1,000 linear feet, and put at a depth of 4 inches. Of the baits tested bran attracted the wireworms most speedily, but germinating wheat seed gradually increased in attractiveness over a longer time. Where only a short time is available for baiting, either of these substances should prove satisfactory, but if time is available, oats are recommended, owing to their cheapness, and they also increase considerably in attractiveness the longer the bait is exposed, though they are slow in becoming attractive. The rows of bait should not be further apart than 6 feet, and the efficiency of the bait is increased at smaller intervals.

The use of growing plants as bait is effective in localised infestations, where the field has not been cleaned before planting the crop. If the crop is growing in continuous rows, the calcium cyanide should be drilled into the ground at the rate of 6 lb. to 1,000 linear feet as close to the roots of the small plants as possible, the application being made at the depth of the greatest wireworm concentration. Where the crop consists of individual plants in hills such as cabbage, etc., these may be treated by placing about ¼ oz. of calcium cyanide in a hole about 3 inches deep made with a sharpened stick, and then covered with soil. The plants in the treated area may be killed, but if untreated, they would be killed by the wireworms, which would then spread further afield.

The broadcast method is best suited for fields where there is a considerable amount of organic matter in the soil, which would render a bait crop ineffective. The field to be treated should be ploughed as late in the spring as possible, so that the wireworms are above the depth of the plough furrow. The calcium cyanide is either scattered in the furrow ahead of the plough or drilled in with a fertiliser drill. In either case the material must be covered immediately to prevent loss of gas. The dosage should be about 400 lb. per acre.

The factors influencing the choice of any one of these methods are briefly enumerated. In general, if the soil is too wet, the gas does not permeate it readily.

WITHYCOMBE (C. L.). **Studies on the Aetiology of Sugar-cane Froghopper Blight in Trinidad. I. Introduction and General Survey.**—*Ann. App. Biol.*, xiii, no. 1, pp. 64–108, 4 figs., 31 refs. Cambridge, February 1926.

From the conflicting circumstances associated with froghopper blight of sugar-cane it is evident that many factors are involved, no one of which can be isolated as the principal cause. In the main, prevalence appears to be governed by environmental conditions, some of which may be altered by agricultural methods, whilst others are beyond control at present. In this paper, which is the first of a series, a general account is given of the interrelationships of the sugar-cane plant and froghopper. The investigations have been carried out in Trinidad, where the species concerned is *Tomaspis saccharina*, Dist. The two important sides to the problem are the factors controlling the numbers of the froghoppers themselves and the conditions influencing the resistance of the sugar-canes to and recovery from attack.

The bionomics of *T. saccharina* are outlined [*R.A.E.*, A, ix, 261]. The adults, which appear to be responsible for the more important damage, feed on almost any grasses and some sedges, and have also been found in small numbers on *Canna edulis*, causing the appearance of yellow marks on the leaves. As a pest, *T. saccharina* is chiefly associated with sugar-cane and occasionally with maize. Although the dry season (January to May) is usually passed in the egg stage, nymphs may also occur in small numbers. A mass attack of large numbers of *T. saccharina* has naturally a serious adverse effect on the sugar-cane, whether it is growing under good or bad conditions, but abundance of the froghoppers is not a necessary condition for serious blight, nor do the plants necessarily show serious blight when the froghoppers have been abundant. Sometimes the conditions favouring increase in the numbers of froghoppers are correlated with those tending to increase the susceptibility of the sugar-cane. The susceptible canes also appear at times to be more attractive to the froghoppers ; it is possible that leaves with subnormal water content contain carbohydrates in a less advanced stage of condensation, and therefore more water-soluble and more easily available to the insect than those of normal sugar-cane leaves. The physiological changes in the leaf are discussed. A reduced amount of lignified tissue might favour froghopper attack, though this is not borne out in fact ; there is also no proof of the possible influence of acidity of the cane on preference of the froghopper. General observations indicate that the froghoppers do not show any marked preference among sugar-canes, and that the increased numbers in localised fields of specially susceptible canes are usually due to causes not yet fully understood. The effect of the feeding of the froghoppers is a removal of water, carbohydrates, proteins, etc., from the plant and an injection of enzymes, etc. As a result, a state can be reached in which the physiological equilibrium of the plant cell has been so far overthrown that recovery, even with ample and immediate water supply, is impossible. The effect on the phloem and other vascular tissues, though not immediately detected, is probably very important. The enzymes of the froghoppers' saliva and those released in the plant continue their action and spread, and the death of the tissues extends until cells are reached that are capable of successful reaction to further development of the pathological changes. Oxidases of the plant and the insects' saliva are apparently responsible for colour changes and increased acidity. A rapid and considerable drop of the pH of the cell sap of the cane is associated with plants likely to succumb; it seems reasonable, therefore, to expect that for a cane to recover it must resist the change in pH or in other ways arrest continued autolytic enzyme action. Hydrogen-ion concentration could be stabilised by buffering agents in the cell sap. The high colloid contents of the juice, especially albumins, such as occur in Uba cane, may exert a beneficial buffering effect, in which case a more resistant cane would probably be a poor cane from the point of view of the sugar manufacturer. The loss of active leaf surface as a result of froghopper injury must result directly in a corresponding reduction in the supply of elaborated products, which accounts for the small starved internodes of the stem that are laid down during blight. The pathological changes occurring in the leaf may also continue in the stem from the top downwards. Recovery of the stem is only possible with renewed leaf surface and renewed power of photosynthesis, which necessitates ample water with required solutes from the soil. The water relations of the plant appear to be highly important in connection with recovery from injury and retardation of the spread of injurious effects. Suggestions for consideration and trial include a discussion of the choice of variety of sugar-cane to be grown, and the possibilities of maintaining a high water content in the plants and increasing the available water in the soil. The influence of environmental conditions on various other insects as observed by different workers is briefly reviewed.

SMITH (K. L.). **A Comparative Study of the Feeding Methods of certain Hemiptera and of the Resulting Effects upon the Plant Tissue, with special Reference to the Potato Plant.**—*Ann. App. Biol.*, xiii, no. 1, pp. 109–139, 4 pls., 10 figs., 20 refs. Cambridge, February 1926.

It has been fairly conclusively proved that among the chief agents in the spread of virus diseases of the potato and many other plants are the one or more species of Aphids that attack them. If the Aphid is a mechanical carrier and does not act as an alternate or obligatory host of the pathogenic organism, it is surprising that other sucking insects, or even all species of Aphids, do not act as transmitting agents. A detailed study of the feeding habits of plant-sucking insects was undertaken in the hope that some light might be thrown on the question as to what insects can or cannot spread the disease. The technique employed is described, the insects used being the Capsids, *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.), and *Lygus pabulinus*, L.; the Jassids, *Eupteryx auratus*, L., and *Erythroneura* (*Zygina*) *pallidifrons*, Edw.; the Aleurodid, *Trialeurodes* (*Asterochiton*) *vaporariorum*, Westw.; the Aphids, *Myzus persicae*, Sulz., *Macrosiphum solanifolii*, Ashm., and *Myzus circumflexus*, Buckt.; and the Coccids, *Aspidiotus hederae*, Vallot, and *Pseudococcus adonidum*, L. (*Dactylopius longispinus*, Targ.). *M. circumflexus* was used for a comparison of the feeding habits, as previous attempts to induce it to act as a carrier of mosaic disease were unsuccessful.

Three types of stylet tracks for Aphids have been described, namely, inter-cellularly to the phloem (this being the line of least resistance), intra-cellularly through the parenchyma with no phloem objective, and intra-cellularly to the phloem, the last two methods being those followed by Aphids with unusually strong mouth-parts. Of the insects studied the Aphids and the Aleurodid follow the first method, though *Macrosiphum solanifolii* may also follow the third. *A. hederae* follows the second method, and *P. adonidum* the third, while the Jassids and Capsids follow either of the methods of intra-cellular feeding. The inter-cellular course would be followed by insects that are unable from their small size to penetrate by pressure and of which the saliva, though having a solvent effect as in Aphids, is not potent enough to enable them to go straight to their objective. Undoubtedly infection would be most likely to start in the phloem elements of the vascular bundle, as they contain the suitable substances for the growth of micro-organisms and would facilitate the dispersal of the virus about the plant.

With regard to plant diseases an important factor to be remembered in the question of insect transmission is the reaction on the part of the plant to the irritation set up by the stylets and to the toxins in the accompanying secretions. The insect causing the least irritation or disorganisation of the plant cells is most likely to inoculate the disease successfully. If the internal economy of the plant is seriously upset, with indications of wound reaction and secondary cell division round the area of the puncture, the point of infection may tend to be isolated from the normal tissue and inoculation thereby be prevented. This condition occurs in the case of Capsids, while the Aphids, the Aleurodid and *P. adonidum* would appear to be the most likely vectors. It remains for the inoculation studies, now proceeding under insect-proof cages with the above-mentioned insects, to be completed before any confirmation of these theories can be forthcoming.

SPEYER (E. R.) & OWEN (O.). **The Fumigation of Tomato Houses with Hydrocyanic Acid Gas.**—*Ann. App. Biol.*, xiii, no. 1, pp. 144–147. Cambridge, February 1926.

The conditions under which fumigation with hydrocyanic acid gas against *Trialeurodes vaporariorum*, Westw., can be done safely in greenhouses have been dealt with by Lloyd [*R.A.E.*, A, x, 284]. The jar method has many disadvantages, including the fact that it is only safe for the plants on still nights. A new method is described by which the gas is generated slowly and which involves less risk of damage to the plants and is considerably cheaper. The principle is the decomposition of sodium cyanide with sodium bicarbonate. One part by weight of fairly finely divided cyanide and three parts by weight of powdered sodium bicarbonate are thoroughly shaken up and the mixture scattered on the paths of the houses at dusk, at the rate of 1 oz. to every 1,000 cu. ft. of space. These proportions need not be varied in accordance with the stage of growth of the plants or the leakiness of the houses. All the adult whiteflies were killed. The same amount of cyanide used in the jar method killed a slightly higher percentage of nymphs, but the plants were slightly scorched. In the new method there is no trace of the cyanide in the mixture after 12 hours, provided that dry conditions prevail. As with jar cyaniding, the treatment should be repeated after 14 to 21 days. Detailed directions for the fumigation of tomato houses by this process are appended.

Dannehl (F.). **Beiträge zur Lepidopteren-Fauna Südtirols.** [Contribution to the Lepidopterous Fauna of S. Tyrol.]—*Ent. Zeitschr.*, xxxix, no. 41, p. 168. Frankfort-on-Main, 6th February 1926.

The larvae of *Brotolomia meticulosa* ab. *ignicula*, n., are recorded as pests of artichokes. Large numbers were also seen in vineyards.

Wahl (B.). **Bericht über die Tätigkeit der Bundesanstalt für Pflanzenschutz in Wien im Jahre 1924.** [Report on the Work of the Federal Institute for Plant Protection in Vienna in 1924.]—*Zeitschr. landw. Versuchswesen in Deutschösterreich*, xxviii (1925), pp. 21–48. Vienna, January 1926.

The insect pests observed in Austria in 1924 include the following: *Oscinella* (*Oscinis*) *frit*, L., common on winter crops in spring; the Scolytid, *Hylastes trifolii*, Müll., on red clover and lucerne; beet-weevils, especially *Bothynoderes* (*Cleonus*) *punctiventris*, Germ.; *Subcoccinella vigintiquatuorpunctata*, L., which was repeatedly observed on sugar-beet; and the Bruchids, *Bruchus* (*Laria*) *pisorum*, L., which caused serious injury to peas, *B. lentis*, Fröl., in lentils, *Bruchidius unicolor*, Oliv., in sainfoin, and *B. cisti*, F., in seeds of laburnum. The woolly aphis, *Eriosoma lanigerum*, Hsm., did comparatively little harm. The plum scale, *Lecanium corni*, Bch., proved so serious that comprehensive measures were taken for a general treatment with fruit-tree carbolineum. In spring there was an outbreak of the caterpillars of *Malacosoma neustria*, L., and defoliation occurred in some localities, but contrary to expectation there was no appearance of the adults in large numbers later on, apparently owing to parasitism. *Scolytus* (*Eccoptogaster*) *mali*, Bechst., injured apple trees; it was associated with *S.* (*E.*) *rugulosus*, Ratz. The foliage of fruit-trees was damaged by *Phyllopertha horticola*, L., and *Phyllobius betulae*, F. Vine pests included *Byctiscus betulae*, L., and the vine-moths, *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff. The first generation of these moths was injurious; the second did little harm.

Experiments seemed to prove that Urania green alone is more effective than with the addition of lime. A solution of 5 per cent. barium chloride was more effective against beet weevils (chiefly *Bothynoderes punctiventris*) than the other insecticides tried.

Seitner (—). *Lonchaea viridana*, **Meig., ein Tannenzapfen- und Samenschädling.** [*L. viridana*, a Pest of the Cones and Seed of Silver Firs.]—*Zentralbl. ges. Forstwesen*, li, 1925, pp. 159–161. (Abstract in *Neuheiten Gebiete Pflanzenschutzes*, 1925, no. 4, p. 18. Vienna, 1925.)

Lonchaea viridana, Mg., oviposits on the tips of the cones of silver firs [*Abies pectinata*], and the larvae bore into the bases of the cones and feed on the seeds. The results of attack by this fly may be very serious if only a few cones are present. Some of the larvae pupate in the cones, others do so in the ground.

Wissmann (H.). **Ueber ein stärkeres Auftreten von freilebenden Gallmilben** (*Phyllocoptes*) **an Obstbäumen und über neue natürliche Feinden der Gallmilben aus der Familie der Cecidomyiden.** [On a Heavy Outbreak of free-living Gall-mites on Fruit Trees and on new Cecidomyiid Enemies of Gall-mites.]—*Zeitschr. Pflanzenkr.*, xxxvi, no. 3–4, pp. 98–106, 16 refs. Stuttgart, 1926.

In 1924 *Phyllocoptes schlechtendali*, Nal., was abundant near Geisenheim, in Hesse-Nassau, and by mid-June it occurred in numbers on the foliage of apple and pear. In the second half of July the mites were completely washed away by rain from pear foliage, but many remained on the undersides of apple leaves until they fell in October. The young leaves were withered in the case of pears, and though this did not occur in apples, the leaves became discoloured. Heavily infested pear shoots were freed from the mites by spraying with a 1 per cent. solution of solbar.

P. fockeni, Nal., caused considerable harm to plums and cherries, especially to nursery trees, the shoots being killed.

P. schlechtendali has been recorded to hibernate beneath the bud scales, generally of apple [*R.A.E.*, A, ix, 167], and this was also the case at Geisenheim. Besides Capsid bugs, the larvae of two Cecidomyiid flies, *Arthrocnodax wissmanni*, Kieff., and *A. mali*, Kieff., are very active enemies of this mite, though *A. mali* was never observed on pear leaves ; one larva of this species was seen in a gall of *Eriophyes tristriatus* var. *erinea*, Nal., on walnut. In the laboratory the larvae of *A. mali* and *A. wissmanni* pupated in white cocoons on the undersides of leaves, but in the field this was never observed and pupation must therefore occur elsewhere. In the case of *A. mali* the pupal stage occupied 15–28 days in late summer.

Smits van Burgst (C. A. L.). **Immuniteit bij planten voor parasitaire aantasting. Waar het wijfje van** *Tortrix viridana* **haar eieren legt.** [Immunity in Plants from Attack by Pests. Where the Female of *T. viridana* oviposits.]—*Tijdschr. Plantenziekten*, xxxii, no. 2, pp. 56–58, 1 fig. Wageningen, February 1926.

Individual trees sometimes remain untouched, though surrounded by others that are heavily attacked by an insect pest, and instances of this that have been recorded in the case of *Tortrix viridana* are quoted. With regard to observations in England that *T. viridana* oviposits on the bark of the branches of oaks and not on the buds or on the younger twigs, it is pointed out that this position is disadvantageous to the newly-hatched larva and is more exposed to the attacks of birds.

Meyer (R.). **Neuere Studien über die Fritfliege.** [New Studies on the Frit Fly.]—*Angewandte Botanik*, v, 1924, pp. 132–142. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, 2te. Abt., lxvi, no. 8–14, pp. 279–280. Jena, 5th February 1926.)

Oscinella (*Oscinis*) *frit* generally has three generations in Europe, with four in the warmer parts. In North Germany there are three ; the first ovipositing in May. The adults of the second appear in July, and those of the third in September, ovipositing on the winter sowings. In spring the attack increases with the postponement of sowing, and in autumn with its advancement. From mid-June to early September pupae are present all the time, and if conditions are very favourable, flies from September pupae oviposit in October. No special variety of cereals is preferred. The main factor is the state of development of the plant, and those up to 5 inches high are chiefly attacked, oviposition decreasing with further growth. The larvae do not migrate from one plant to another. If plants are buried shortly before pupation, the adults can emerge through considerable layers of earth. Eggs ploughed under in autumn do not develop in spring when brought to the surface. Larval development probably requires six weeks in spring and summer, but the winter generation has a resting period, and then resumes feeding in spring prior to pupation.

The food-plants of *O. frit* in Germany are not well known. In eastern Germany couch-grass [*Agropyron repens*] seems to be an intermediate food-plant. The author considers that in experiments to ascertain the resistance of varieties of oats to attack the plants should be entirely protected from infestation until they have attained a certain height, after which the comparisons may be made. The varieties that develop rapidly are the most resistant.

The natural enemies of *O. frit* include the Cynipids, *Cothonaspis* (*Hexaplasta*) *exatoma* and *Eucoila* (*Rhoptromeris*) *eucera*, and the Chalcids, *Trichomalus cristatus* and *Halticoptera suilius*.

ESCHERICH (K.). **Die "Flugzeugbekämpfung" des Kiefernspanners im bayrischen Forstamt Ensdorf.** [The Use of Aeroplanes against *Bupalus piniarius* in the Bavarian Forestry Division, Ensdorf.]—*Forstwiss. Centralbl.*, 1926, no. 3, pp. 73–94, 8 figs. Berlin, 1926.

At the end of 1924 at various forestry stations in the Palatinate, Franconia and Bavaria attempts were made to check an outbreak of *Bupalus piniarius* by destroying the pupae by digging up and collecting the forest litter, and strewing the surface with quicklime, etc., but they proved ineffective. In the summer of 1925 oviposition was general, and in some areas from 3,000 to 7,000 eggs were laid on each tree crown. Tentative experiments with aeroplanes were begun on 27th July, and the work was carried out on a large scale in September. A passenger plane was fitted with a bag container for about 550 lb. of a proprietary arsenical insecticide (a quantity thought sufficient for treating 13½ acres) and with a rotor mechanism for discharging the dust cloud. The dust was packed in specially shaped tins from which the container could be filled in 5–6 minutes by 4 men, who did not need to wear respirators. This enabled the machine to restart in 7–8 minutes from the time of landing.

Owing to unfavourable weather, flights could be made only on 19 days out of 44, with an average of 4 per day, so that only about 810 acres were treated in 6 weeks. It was found useless to dust in a wind with a speed of over 2–3 metres per second, in rain that is either heavy or continuous, or in strong sunshine, which causes strong vertical air currents. The quantity of insecticide used was found to be insufficient, especially when the trees were taller than 15 feet, and improvements in the insecticide and in the dust distributor are necessary.

SEITZ (A.). **Holzkäferschäden in der Neuzeit.** [Injuries by Wood-boring Beetles in Recent Times.]—*Aus Natur und Museum, Ber. Senckenberg. naturf. Ges.*, lvi, pt. 1, pp. 23–26, 1 fig. Frankfort-on-M., January 1926.

Niptus hololeucus, Fld., has spread in northern and western Germany in recent years. Unlike *N. crenatus*, F., which is indigenous, *N. hololeucus* is an introduction from the East and has increased enormously owing to the lack of natural controlling factors. It is scarcely practicable to ascertain these, and recourse must be had to traps, to injections of paraffin into the bore-holes, or to the removal of infested wood, etc.

KRIEG (H.). **Die Bekämpfung forstlicher Schädlinge vom Flugzeug.** [The Control of Forest Pests from Aeroplanes.]—*Verh. naturhist. Ver. preuss. Rheinl. u. Westf.*, lxxxii (1925), pp. 40–50, 1 fig., 6 refs. Bonn, 1926.

The information given here is substantially the same as in a paper already abstracted [*R.A.E.*, A, xiii, 539].

TITSCHACK (E.). **Ueber die imaginale Lebensdauer der Kleidermotte,** *Tineola bisselliella* **Hum.** [On the Duration of Adult Life of the Clothes Moth, *T. bisselliella*.]— *Verh. naturhist. Ver. preuss. Rheinl. u. Westf.*, lxxxii (1925), pp. 330–348, 5 refs. Bonn, 1926.

In these experiments the males of *Tineola bisselliella* lived for an average period of 14 days, the unfertilised females for 11·9, and the fertilised females for 8·2. No data on oviposition are given.

JANISCH (R.). **Eine neue Methode zur vergleichenden Beurteilung der Wirksamkeit von Insektenfrassgiften.** [A new Method for comparing the Efficiency of Stomach Insecticides.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 3, pp. 18–20. Berlin, March 1926.

The procedure adopted in these experiments was as follows : Larvae of *Pieris brassicae* that had all undergone their last moult on the same day, were placed in Petri dishes and fed for 1–2 days on unpoisoned leaves. Then they were given cabbage leaves poisoned by being shaken up in a bottle containing the insecticide tested, in dust form. The leaves were weighed before and after dusting, and their outlines were traced on squared paper before and after feeding. It was thus possible to ascertain the quantity of poison ingested up to death. A table is given showing the amounts for 21 metallic compounds, sulphur and phosphorus. A second table shows the number of days of feeding on the poisoned leaves. The experimental data agree with the results that have been obtained empirically with stomach poisons. Diortholead arsenate was found superior to all other relatively insoluble arsenical compounds. Contrary to what is usually believed, compounds of barium and fluorine require a comparatively large dosage in order to be effective.

Speyer (W.). *Pimpla pomorum* **Ratz. (Ichneumon.), der Parasit des Apfelblütenstechers,** *Anthonomus pomorum* **L. (Coleopt.).** [*P. pomorum*, the Parasite of the Apple Blossom Weevil, *A. pomorum*.] —*Arb. biol. Reichsanst. Land- u. Forstw.*, xiv, no. 3, pp. 231–257, 15 figs., 2 pp. refs. Berlin, 1926.

The injury done by *Anthonomus pomorum*, L., and the measures that are advised against it are discussed. The natural enemies of this weevil include the fungi, *Verticillium puparum* and *Isaria* sp., spiders, a predacious thrips, *Aeolothrips fasciatus*, Hal., and many parasitic Hymenoptera. Of the latter the Ichneumonid, *Pimpla pomorum*, Ratz., is the most important, and the morphology and biology of all its stages are described in detail. The possibilities of utilising it are discussed. Its effectiveness is limited to a certain extent owing to its being apparently monophagous and to its having only one generation a year. The increase of the parasite may be promoted by collecting and destroying the apple buds infested by the weevil earlier than usual, *i.e.*, immediately the edges of the petals begin to brown. The weevil larvae are then young, and as only mature larvae are parasitised, this advance in time obviates the destruction of the parasites, and further such buds as are overlooked are more sure to be visited by the Ichneumonids. As an alternative even the fully browned buds may be collected (this requiring less care) and kept in room free from cracks. The weevils emerge about 8 days before the parasites and collect at the window where they should be crushed ; and later on, never later than 14 days after the appearance of the first weevils, the window should be opened to allow the parasites to escape. It is useless to adopt gauzes of different mesh owing to overlapping in the sizes of the pest and its parasite.

Trappmann (W.). **Methoden zur Prüfung von Pflanzenschutzmitteln. I. Benetzungsfähigkeit.** [Methods of Testing Insecticides and Fungicides. I. Wetting Power.]—*Arb. biol. Reichsanst. Land-u. Forstw.*, xiv, no. 3, pp. 259–266. Berlin, 1926.

Traube's stalagmometer or drop-pipette enables a count of drops to be made, thus permitting the comparative measurement of the wetting power of spray solutions, which is dependent on molecular forces. Tables are given showing the wetting power of various proprietary insecticides and of soap solutions. As regards the latter, it was found that the wetting power of the solution is much decreased by the precipitation of soap in water containing lime. When hard water has to be employed, the addition of a further 0·75–1 per cent. of soap is necessary for surfaces that are difficult to wet. Soap cannot be used in arsenical sprays containing lime.

Janisch (R.). **Lebensweise und Systematik der " Schwarzen Blattläuse."** [Biology and Classification of the " Black Aphids."]—*Arb. biol. Reichsanst. Land-u. Forstw.*, xiv, no. 3, pp. 291–366, 3 pls., 37 refs. Berlin, 1926.

Börner's treatment of the various black Aphids as distinct species [*R.A.E.*, A, x, 262, 505] is followed in this paper. The classifications adopted by other workers and the biological considerations that have influenced Börner and the author are discussed. In a superficial comparison the somewhat long hairs of the antennae and legs of *Aphis viburni*, F., distinguish it from *A. euonymi*, F., and the other species occupy a position between these two extremes. A table is given of the lengths of the hairs of the fifth antennal joints of the apterous females. A second table records the lengths of the marginal hairs on the abdomen; in *A. euonymi*, *A. rumicis*, L., and *A. hederae*, Kalt., these hairs are never longer than the length of the tubercles of the prothorax or of the first abdominal segment, whereas they are considerably longer in *A. fabae*, Scop. (of which *A. papaveris*, F., is treated as a synonym), *A. mordwilkoi*, B. & J., *A. viburni*, *A. philadelphi*, Börner, and *A. podagrariae*, Schr. A third table shows the numerical distribution of these hairs in the various species, and a fourth compares the lengths of the hairs on the legs. The close relationship of these species is evident in the similarity of morphology and colour. The differences of most importance occur in the structure of the sexual generation, which in turn is partly connected with the presence or absence of the change of food-plant. The migratory species, *A. fabae*, *A. euonymi* and *A. mordwilkoi*, have winged males; the monophagous species, *A. viburni*, *A. rumicis*, and *A. hederae*, have wingless males, those of *A. podagrariae* being, however, winged. The change of food-plant has not been ascertained in the case of *A. philadelphi*, which has winged males. *A. ilicis*, Kalt., has not been studied in this connection. A key embodying the points mentioned above is given to the various species, and this is followed by a detailed biology in each case.

FLACHS (—). **Die Azaleenmotte als neuer Schädling in Münchens Gärtnereien.** [The Azalea Moth as a new Pest of Horticulture in Munich.]—*Ent. Zs.*, xxxix, no. 44, pp. 177–178. Frankfort-on-Main, 27th February 1926.

Gracilaria azaleella, Brants, probably imported from Japan on azaleas, has been spreading in Europe and is attacking these plants in Munich. The eggs are laid on the underside of the leaves, in which the young larvae mine. Later, they feed inside the leaf tips, which they roll up. Pupation takes place in a web on the under-surface. There are two generations a year, the larvae of the first being found throughout the winter, those of the second only during June and July.

Control consists in spraying with a 1 per cent. tobacco mixture, or with soapy water mixed with tobacco extract, but the best method is to crush the leaves containing the insects.

[ARĪSTOV (M. T.).] **Аристов (М. Т.). The Rôle of *Anthonomus pomorum*, L., in the Periodicity of the Apple Crop.** [*In Russian.*]—*Ann. State Inst. Exptl. Agron.*, iii (1925), no. 5–6, pp. 250–257. Leningrad, 1926.

It has been suggested that *Anthonomus pomorum*, L., might be one of the factors responsible for the periodicity of the apple crop. The observations described show that this is dependent on the physiological condition of the tree and is in no way connected with the weevil.

[Meĭer (N. F.).] **Мейер (Н. Ф.). On the Immunity of some Larvae in Relation to their Parasites.** [*In Russian.*]—*Ann. State Inst. Exptl. Agron.*, iii (1925), no. 5–6, pp. 260–265, 2 figs., 2 refs. Leningrad, 1926.

The failure of parasites to develop in certain larvae [*R.A.E.*, A, xiii, 543] has further been observed in the case of *Pieris brassicae*, L., and *P. rapae*, L., which are parasitised by *Apanteles glomeratus*, L., and *Anilastus ebeninus*, Grav., in northern Russia. In view of this apparently acquired immunity, the extensive propagation of the parasites locally would not prove of any great value, as even large numbers would be unable to upset the natural equilibrium.

[Mordvĭlko (A. K.).] **Мордвилко (А. К.).** *Phylloxera* **in North Caucasus (Kuban Province and Black Sea Coast). Observations made in 1925.** [*In Russian.*]—Severo-Kavkazs. Kraev. Stantz. Zashch. Rast. [*North-Caucasian Regional Sta. Plant Protect.*], Ser. A, no. 9, 38 pp., 3 pp. refs. Rostov-on-Don, 1925. [Recd. February 1926.]

Previous references to the occurrence of *Phylloxera* in the vineyards of the northern Caucasus are extensively reviewed, with particular consideration of the suggested methods of dispersal, such as being carried by agricultural implements, soil, and various parts of the vine plant. The author, however, considers that the only danger of spread is by natural means, such as wind and water, or by transplanting infested stock. The latter may be freed from infestation by being dipped for 5 minutes in water having a constant temperature of 50° C. [122° F.]. Though most larvae are killed after immersion for one minute, the longer period ensures the death of any individuals that are more sheltered.

Fresh vineyards should not be planted to leeward of those already infested, nor should they be started on a lower level, as in this case they are liable to infestation carried by water.

A study of various points, such as the distance that larvae will travel from one plant to another, or the possibility of preventing their emergence from the soil or their entry to the roots, by the use of sand round the base of the stock, or of some form of sticky band, etc., will probably indicate some effective means of controlling this pest in the future.

Minkiewicz (S.). **The Occurrence of** *Phytometra* (*Plusia*) *gamma*, **L., in the Vilna District in 1922.** [*In Polish.*]—*Choroby i szkodniki roślin*, 1925, no. 3, reprint, 9 pp., 9 refs. [Pulawy, 1925.] [Recd. March 1926.]

An account is given of the occurrence of *Phytometra* (*Plusia*) *gamma*, L., in Europe since 1735, with particulars of the years of greatest abundance. The food-plants and biology of this moth, as observed during an outbreak in Vilna in 1922, are discussed, and remedial measures are described.

Woroniecka (J.). **A Study on the Biology of the Green Bud-worm,** *Argyroploce variegana*, **Hb., and the Bud-moth,** *Eucosma (Tmetocera) ocellana*, **F.** [*In Polish.*]—*Mém. Inst. natnl. polon. Econ. rur. Pulawy*, vi, A, pp. 367–394, 1 pl., 30 refs. Cracow, 1925. (With a Summary in English.) [Recd. February 1926.]

A large number of Tortricids are injurious in orchards in Poland during the spring; these are *Argyroploce variegana*, Hb., *Eucosma (Tmetocera) ocellana*, F., *Tortrix (Pandemis) ribeana*, Hb., *T. (P.) heparana*, Schiff., *T. (Cacoecia) xylosteana*, L., *T. (C.) rosana*, L., and *T. diversana*, Hb.

A. variegana and *E. ocellana* are the more important pests and cause the chief injury to apples in the Lublin district.

An account is given of the life-history and habits of these two moths as studied under local conditions. The adults of *A. variegana* are on the wing in June. The eggs are mostly laid on the lower surface of leaves and hatch in from 9 to 10 days. The larva feeds under a silken web on the lower surface. After 3 weeks it finds suitable winter quarters, such as bud scales or crevices in the bark, and spins a hibernaculum in which it remains until the following spring. Towards the end of April it emerges and enters the buds, where it eats the expanding leaves and flowers, this period lasting from 18 to 28 days. For pupation it passes on to fresh foliage, and constructs a small capsule of a leaf, or by tying two leaves together. The pupal stage varies from 9 to 12 days according to climatic conditions. The development of *E. ocellana* is similar to that of *A. variegana*, but it remains 4–5 weeks in the buds in the spring and is therefore more injurious. Pupation occurs in ramifications of twigs and crevices of the bark, the pupal stage lasting 15–22 days. The adults as a rule emerge between the middle of June and middle of July. The eggs are laid on both sides of the leaves and hatch in 8–10 days.

The larvae of both species are parasitised by *Ascogaster quadridentatus*, Wesm., and *Pristomerus vulnerator*, Panz. *Glyptoflava lineata*, Grav., was reared from *A. variegana*, and *Microdus dimidiator*, Nees, *M. rufipes*, Nees, and *Meteorus ictericus*, Nees, from *E. ocellana*. *G. lineata* and *A. quadridentatus* are the most numerous and of considerable importance in the control of these Tortricids.

The work of Sanders and Dustan on the control of these pests [*R.A.E.*, A, vii, 309] is quoted.

Minkiewicz (S.). **The Development and Biology of** *Simaethis pariana* **Clerck**= *Hemerophila pariana* **Clerck.** [*In Polish.*]—*Mém. Inst. natnl. polon. Econ. rur. Pulawy*, vi, A, pp. 330–365, 2 pls., 23 refs. Cracow, 1925. (With a Summary in English.) [Recd. March 1926.]

Hemerophila pariana, Clerck, occurred in destructive numbers on apple near Pulawy in 1920 and again in 1925. The chief damage is done by the larvae of the second generation. The third is less injurious, apparently as a result of the activity of parasites among the larvae of the second; these include the Ichneumonids, *Pimpla alternans*, Grav., *P. sagax*, Hartg., *Mesochorus testaceus*, Grav., and *Eulimneria fuscicarpus*, Thoms., the Chalcids, *Dibrachys boucheanus*, Ratz., and *Pteromalus* sp., and the Braconid, *Apanteles albipennis*, Nees. The larvae are preyed upon by the Anthocorid, *Triphleps minuta*, L., and by *Forficula auricularia*, L. Except for seasonal variations the life-history is similar to that recorded for Connecticut [*R.A.E.*, A, xi, 381]. The author never succeeded in keeping any of the autumn pupae through the winter, the adults emerging in November and some of them hibernating in cages among leaves, moss, etc.

During the outbreak of 1920, good results were obtained by spraying with Paris green, at the rate of 3 lb. to 10 lb. quick lime and 500 gals. water. The spray was applied as the larvae of the second generation began to hatch, and a week later only a few individuals could be found.

[MOKRZHETZKIĬ (S.).] MOKRZECKI (Z.). **Dusting from Aeroplanes and the Fumigation of Forests for the Control of the Nun Moth.** [*In Polish.*]—*Las Polskie*, no. 1, reprint, 12 pp., 4 figs., 6 refs. Warsaw, 1926. (With a Summary in German.)

During June and July 1925 experiments were made in Pomerania with calcium arsenate dusted from aeroplanes over pine forests for the control of *Lymantria* (*Liparis*) *monacha*, L. It was discovered that the crowns of the trees had a negative charge of electricity and that if the calcium arsenate was given a positive charge it adhered to the needles. For the fumigation, fumigating candles were used. As they burnt down, gas clouds were released that eventually deposited lead oxide or arsenious oxide on the needles. The larvae are not killed by the gas, but by feeding on the poisoned needles. The gas proved innocuous to plants, birds and man. Both methods proved effective, and the entire infestation was wiped out, but the results of the July fumigation are not conclusive, as a large number of the larvae were destroyed by *Empusa anticae* and Tachinids.

Report of the Institute of Plant Protection for 1924-25.—*Latvian Central Agric. Soc.*, 26 pp., 8 figs. Riga, 1925. [*In Latvian.*]

In 1924, the average percentage of infestation by *Chlorops taeniopus*, Mg., was 13 for rye and 37 for barley, but in consequence of the variable winter of 1924–25 about 77 per cent. of the hibernating larvae perished. *Mayetiola destructor*, Say, was also an important cereal pest, damaging up to 50 per cent. of the crop. *Hydrellia griscola*, Fall., which in the previous year caused considerable damage to barley, was met with but rarely in 1924.

Phaedon cochleariae, F., and *Pieris brassicae*, L., attacked cruciferous plants very severely. Spraying with lead arsenate and other arsenicals against the former did not give effective results, whereas the use of cardboard discs covered with an adhesive proved excellent. *Hylemyia antiqua*, Mg., destroyed from 2 to 90 per cent. of the onion crop.

Anthonomus pomorum, L., was very abundant, sometimes causing a loss of 100 per cent. of the apple blossoms, but damage by *Cydia* (*Carpocapsa*) *pomonella*, L., was insignificant. Strawberries suffered considerably from *Galerucella tenella*, L., which is recorded for the first time as a pest in Latvia.

Other insect pests were *Cephus pygmaeus*, L., *Ochsenheimeria taurella*, Schiff., *Illinoia* (*Acyrthosiphon*) *pisi*, Kalt., *Sitona* (*Sitones*) *lineata*, L., *Phyllotreta nemorum*, L., *Trioza viridula*, Zett., *Pegomyia hyoscyami*, Panz. (*conformis*, Fall.), *Aphis rumicis*, L., *Depressaria nervosa*, Hw., *Psylla mali*, Schmidb., *Argyresthia conjugella*, Zell., *Hemerophila* (*Simaethis*) *pariana*, L., *Cheimatobia brumata*, L., *Neurotoma flaviventris*, Retz., *Eriophyes ribis*, Nal., *Anthonomus rubi*, Hbst., *Emphytus cinctus*, L., and *Gracilaria syringella*, F.

In the course of some experiments on the relation of the depth of sowing to attacks on oats by the larvae of *Agriotes* sp., it was found that at 2 cm. the number of damaged plants was 23 per cent., at 3 cm. 29 per cent., at 4 cm. 30 per cent., at 6 cm. 40 per cent., and at 8 cm. 39 per cent.

WILKINSON (D. S.). **Entomological Notes.**—*Cyprus Agric. Jl.*, xxi, pt. 1, pp. 10–12. Nicosia, January 1926.

The insects recorded in this second list [*R.A.E.*, A, xiii, 167] include :—

Coleoptera.—*Tenebroides mauritanicus*, L., and *Tribolium castaneum*, Hbst., in stored grain ; *Coccinella septempunctata*, L., of great local abundance, particularly attacking *Aphis rumicis*, L., on beans ; *Omophlus propagatus*, Kirsch, the adults apparently feeding on ears of standing wheat ; *Bruchus lallemanti*, Mars., attacking seeds in the pods of *Acacia farnesiana* ; *Labidostomis decipiens*, Fald., on various plants including vine and tobacco ; *Anthonomus cyprius*, Mshl., the larvae of which feed inside unopened peach tree buds ; *Calandra sculpturata*, Gyll., intercepted in seed of *Eugenia jambolana* from Tanganyika Territory ; *C. granaria*, L., and *C. oryzae*, L., in stored grain ; *Lixus lutescens*, Cap., on artichoke ; *Sitona limosa*, Rossi, on broad beans ; *S. oculata*, Kust. ; *Epicometis hirta*, Poda, causing much damage to seedling pine trees in nurseries ; and *Oxythyrea abigail*, Rche.

Rhynchota.—*Aphis rumicis*, L., a major pest of beans and peas ; *Dilachnus taeniatus*, Mdv., on young pine trees ; and *Coccus hesperidum*, L., on orange leaves.

Lepidoptera.—*Hellula undalis*, F., boring in the heads of seedling and fully grown cabbage ; *Cydia pomonella*, L., causing much damage throughout the apple growing districts ; *Hyponomeuta padellus*, L., on apple ; and *Plutella maculipennis*, Curt., attacking seedling cabbages.

Diptera.—*Lonchaea aurea*, Macq., bred from cotton bolls infested with *E*[*arias*] *insulana*, Boisd., and *P*[*latyedra*] *gossypiella*, Saund. ; and the Tachinid parasites, *Compsilura concinnata*, Mg., *Tricholyga segregata*, Rd., and *Ceratochaeta caudata*, Rd., bred from larvae of *Thaumetopoea wilkinsoni*, Tams.

Hymenoptera.—*Eurytoma amygdali*, Endl., infesting apricot stones ; *Pimpla roborator*, F., bred from cotton bolls attacked by *E. insulana* and *P. gossypiella* ; *Ephialtes extensor*, Taschb., and *Pristomerus vulnerator*, Gr., from a cage containing hibernating larvae of *Cydia pomonella* ; *Erigorgus melanotatus*, Grav., bred from larvae of *T. wilkinsoni* ; and *Trioxys centaureae*, Hal., *Ephedrus validus*, Hal., and *Aphidius cirsii*, Hal., parasites of *Aphis rumicis*.

WILKINSON (D. S.). **A Summary of the Legislation in Cyprus against Insect Pests.**—*Cyprus Agric. Jl.*, xxi, pt. 1, pp. 25–30. Nicosia, January 1926.

This summary provides means of reference with regard to the broad outlines of the various orders at present in force.

For the control of *Eurytoma amygdali* all infested almonds must be destroyed before the 1st October in every year. Sprays of Paris green are to be applied twice between 15th April and 31st May in areas infested by *Hyponomeuta malinellus*. Apple, pear, peach, plum, quince and walnut trees must be protected from *Cydia* (*Carpocapsa*) *pomonella* by lime washing the base between 1st February and 31st March; all fallen fruit must be buried under lime immediately; and the trees must be banded before 15th July, these bands to be removed and burned before the trees are lime washed. All cotton plants and mpamia plants are to be destroyed before a fixed date in the areas declared infested with *Earias insulana* and *Platyedra* (*Gelechia*) *gossypiella*. All vines suspected of being infested with *Zygaena ampelophaga* are to be sprayed in April with Paris green.

The existing orders dealing with the importation of plants from various countries are also summarised.

Williams (C. B.). **Seasonal Variation in Pink Boll-worm Attack on Cotton in Egypt in the Years 1916-1924.**—*Egypt Minist. Agric.*, Bull. 67, 12 pp., 3 figs. Cairo, 1926.

A summary of these statistical investigations up to 1922 has already been noticed [*R.A.E.*, A, xii, 460]. Since then the bolls have been collected at 10-day intervals from plants chosen at random, and it now seems possible to draw some reliable conclusions from this work, which are here discussed. There seems to have been a remarkable correlation for at least 6 years (1919–1924) between the date of the pink boll-worm attack and the condition of advancement or retardation of the crop, so that a position of stability appears to have been reached, in which the percentage of damage is about the same each year. The incidence of pink boll-worm attack varies with small variations of the cotton crop that are due to environment and climatic influences, and also varies with the large alterations that are independent of these, and are due to direct interference. The pest is evidently ready to develop at any time during the spring and summer as soon as the cotton crop is in a suitable state to be infested.

From the results of observations made in Lower Egypt in 1921 it would appear that the association holds not only for the same place in different years, but also perhaps for different places.

Poulton (E. B.). **A Cassidid Beetle Pest of a Timber-tree in Kenya Colony.**—*Trans. Ent. Soc. London*, 1925, pt. iii-iv, pp. lxiii-lxiv. London, 5th February 1926.

According to Dr. V. G. van Someren, the Cassidid, *Cassida jeanneli*, Spaeth, does an immense amount of harm in Kenya Colony to a valuable timber tree, *Brachylaena hutchinsi*, by destroying the young growing shoots. The Pentatomid, *Macrorhaphis infuscata*, Wlk., and the Reduviid, *Phonoctonus formosus*, Dist., were found preying on this beetle.

Departmental Activities. Entomology.—*Jl. Dept. Agric. Union S. Africa*, xii, no. 2, pp. 100–105. Pretoria, February 1926.

Lygaeus militaris, F., has been attacking fruit in the Cape Province, but in every case the fruit was infested with larvae of *Ceratitis capitata*, Wied. Tomatos have been attacked in the Transvaal by *Dacus* (*Tridacus*) *pectoralis*, Wlk., which also infests papayas. Over 60 flies were reared from 2 tomatos; the eggs are laid while the fruit is still green. Two-year-old trees of *Pinus longifolia* have been found dying in the Transvaal presumably as the result of infestation by a Cerambycid. *Pantomorus godmani*, Crotch, is recorded from *Eucalyptus* on the Rand; it occurs in the United States, and it is impossible to say how or when it was introduced into South Africa. The relative attractiveness of the different species of *Eucalyptus* to the eucalyptus weevil [*Gonipterus scutellatus*, Gyll.] is discussed. The importance of winter ploughing for the control of cutworms is pointed out; there should be at least a month between ploughing and planting.

Yokoyama (K.). **Studies on the** *Glyphodes pyloalis*, **Walker, of Japan. Contribution 1.—Bionomics and External Anatomies.**—*Bull. Imp. Sericult. Expt. Sta. Japan*, ii, no. 2, pp. 47–101, 3 pls., 36 refs. Tokyo, November 1925. [Recd. February 1926.]

Glyphodes pyloalis, Wlk., is a serious pest of mulberry trees, and is widely distributed in Japan with the exception of Hokkaido. It also occurs in China, and throughout India, Ceylon and Burma. The first appearance of the adults depends on various environmental conditions, but usually occurs about the latter half of May; they are most numerous in June. The second generation of adults appears about the middle of July, the third in the middle of August, and the fourth at the end of August and beginning of September. The larvae resulting from the eggs of the fourth generation spin a cocoon in which they hibernate. The eggs are generally laid on the lower surface of the leaves of the mulberry tree. They hatch in 5 or 6 days. The larvae feed on the lower surface of the leaves supported by a rough net; but after the third instar they fold the leaf into a sheath in which they live and continue feeding. In the case of food-shortage or danger they move to another place along a thread. The length of the larval stage varies from 13 to 19 days for the first three generations, and from 247–271 for the hibernating one. The pupal stage of this generation lasts about 20 days, whereas in the others it lasts about a week. Pupation occurs in a suitable place on the ground or in crevices and depressions on the trunk. The hibernating larvae begin to pupate about the middle of May. In Formosa, according to Maki, there may be 10 generations a year (not one, as erroneously recorded in the abstract of his paper [*R.A.E.*, A, vi, 174]).

The natural enemies of this moth include eight Hymenopterous parasites and a Nematode that attacks the larvae. These are to be dealt with in a subsequent paper.

The remedial measures recommended are the collection of adults at light traps, the collection of hibernating larvae (to facilitate this artificial hibernation quarters in the form of straw wound round the tree should be provided), and spraying before the larvae roll the leaves with an emulsion of kerosene or with soap solution mixed with pyrethrum.

UCHIIKE (T.). **Studies on** *Eriocampoides limacina* **Retz. (Tenthredinidae) very injurious to Fruit Trees.** [*In Japanese.*]—*Insect World*, xxx, no. 1, pp. 2–11, 1 pl. Gifu, January 1926.

In recent years *Caliroa* (*Eriocampoides*) *limacina*, Retz., has been very injurious to various fruit trees in Fukushima prefecture, where this sawfly has usually two generations a year, hibernating in the larval stage. The female, on the day of emergence, begins to oviposit into the leaf tissue, resting on the lower side of the leaf. The eggs hatch in about 9–15 days.

TAKAHASHI (S.). **On the Original Home of** *Calandra oryzae*, **L.** [*In Japanese.*]—*Insect World*, xxx, no. 1, pp. 12–17. Gifu, January 1926.

In the author's opinion, some temperate country, and not India, is likely to be the original home of *Calandra oryzae*, as a temperature of 28·9° C. [84·02° F.] is the optimum, and 30° C. [86° F.] is not suitable for this weevil.

MURATA (J.) & IKEDA (T.). *Lema melanopa*, **L.** (*tristis* **Herbst of authors) in Nagano Prefecture.** [*In Japanese.*]—*Jl. Plant Protect.*, xiii, no. 1, pp. 9–19. Tokyo, January 1926.

The Criocerid, *Lema melanopa*, L., is distributed over Japan and causes great damage to rice. In the Nagano prefecture there is one generation a year, hibernation occurring in the adult stage. The adults begin to feed from the end of May, mate and oviposit. One female can lay more than 100 eggs in several masses. These hatch in about 10 days, and the larvae devour the leaves, covering the dorsal surface of their own bodies with excrement. They pupate in white cocoons on the leaves, 2–3 weeks after hatching. The adults emerge in late July or early August and soon hibernate without mating.

KAWAMURA (M.). **On** *Podops lurida* **Burm. (Pentatomidae) injurious to the Rice Plant.** [*In Japanese.*]—*Jl. Plant Protect.*, xiii, no. 1, pp. 28–32. Tokyo, January 1926.

The Pentatomid, *Podops lurida*, Burm., has one generation a year, hibernating in the adult stage. The adults begin to feed on the rice plant from the end of June and oviposit in July. One female lays 18–43 eggs in 2–3 groups during life. The eggs hatch in 3–8 days, and the nymphs mature in September, 36–40 days after hatching.

DU PASQUIER (R.). **Renseignements sur les théiers d'Indochine et sur leur culture.**—*Handelingen v. h. Thee-Congress te Bandoeng 1924*, pp. 297–302, 1 map. Weltevreden [1924]. [Recd. March 1926.]

The principal insect pests of tea in French Indo-China are *Helopeltis*, which occurs everywhere in the tea districts; *Andraca bipunctata*, the chief pest in the Phu-Tho region; *Heterusia cingala*, the caterpillars of which were sporadic in 1922–23, but increased rapidly in March 1924; *Clania crameri* and *Amatissa consorta*, chiefly found in the cold weather; *Zeuzera coffeae*; and *Toxoptera aurantii* (*Ceylonia theaecola*).

MENZEL (R.). *Helopeltis* **en andere Thee vijanden.** [*Helopeltis* and other Pests of Tea.]—*Handelingen v. h. Thee-Congress te Bandoeng 1924,* pp. 192–198. Weltevreden [1924]. [Recd. March 1926.]

This is a brief account of the various pests of tea in the Dutch East Indies and contains no new information.

BERNARD (C.). **Geschiedenis der "Roest"-plaag** (*Helopeltis*). [The History of Tea Rust (*Helopeltis*).]—*Gedenkboek Ned.-Indische Theecultuur 1824–1924,* pp. 96–99. Weltevreden [1924]. [Recd. March 1926.]

This is a brief survey of the occurrence of *Helopeltis* on tea.

Ontdekking van de vorzaak der z.g. roest in de thee door Meijboom. [The Discovery by Meijboom of the Cause of the so-called "Rust" of Tea.]—*Gedenkboek Ned.-Indische Theecultuur 1824–1924,* pp. 184–187. Weltevreden [1924]. [Recd. March 1926.]

The discovery by C. Meijboom* (who is said to be always cited in English references as C. Aleyboom) of *Helopeltis* as the cause of tea rust is described.

MENZEL (R.). **Over de in** *Helopeltis* **parasiteerende sluipwesp.** [The Hymenopterous Parasite of *Helopeltis*.]—*De Thee,* v, no. 4, pp. 115–120, 1 pl. Buitenzorg, December 1924. [Recd. March 1926.]

The Braconid parasite of *Helopeltis* in Java [*R.A.E.*, A, xiii, 223] is a species of the genus *Euphorus* and not of *Apanteles*. Development from egg to adult requires 35–40 days, a little longer than the time taken by its host. The number of annual generations is thus nearly the same as in *Helopeltis*. The female Braconid does not appear to to oviposit in already parasitised *Helopeltis*.

MENZEL (R.). *Euphorus helopeltidis* **Ferrière, de in** *Helopeltis*-**mikoengs parasiteerende sluipwesp (Braconide).** [*E. helopeltidis*, the Braconid parasitising the Larvae of *Helopeltis*.]—*De Thee,* vi, no. 2, p. 47, 1 pl. Buitenzorg, June 1925. [Recd. March 1926.]

The Braconid parasitising *Helopeltis* in Java has now been described as new by Ferrière under the name *Euphorus helopeltidis*. One batch of material showed that 70–80 per cent. of the larvae were parasitised.

HALEWIJN (E.). **Bestrijding van den houtboorder der** *Albizzia*. [The Control of the Wood Borer of *Albizzia*.]—*De Thee,* v, no. 4, pp. 132–133. Buitenzorg, December 1924. [Recd. March 1926.]

A wood borer attacking *Albizzia* has been effectively combated in young trees and those up to a height of 12 ft. by inserting rags or coconut fibre soaked in tar into the bore-holes. In quite small holes the tar alone may be introduced. The wounds heal completely in time.

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* Tijdschr. Ind. Landb. Genootschap, iii (1873) p. 117.

BERNARD (C.). **Boorders-bestrijding bij** *Albizzia.* [The Control of Borers in *Albizzia.*]—*De Thee,* vi, no. 2, p. 46. Buitenzorg, June 1925. [Recd. March 1926.]

Referring to the above paper it is stated that, while the method and its results are satisfactory, they are actually directed against the bark-eating borer moths, *Arbela* spp. The bores made by these are utilised by the actual dangerous wood-borers, such as *Batocera,* for oviposition, and the treatment recommended tends to prevent infestation by these.

BERNARD (C.) & STEINMANN (A.). **Luizenschimmels.** [Fungi parasitising Coccids.]—*De Thee,* vi, no. 2, pp. 42–45, 1 pl. Buitenzorg, June 1925. [Recd. March 1926.]

In this brief discussion of entomogenous fungi, stress is laid on the fact that their action in checking insect pests cannot be relied on.

VAN HOOFF (H. W. S.). **Iets over** *Albizzia, Helopeltis* **en droogte.** [Some Notes on *Albizzia, Helopeltis* and Drought.]—*De Thee,* vi, no. 2, pp. 54–57. Buitenzorg, June 1925. [Recd. March 1926.]

Albizzia has been supposed to encourage *Helopeltis* on tea estates, and its own requirements of moisture are detrimental to tea during the dry season. In spite of these facts, its presence is considered on the whole advantageous to the tea planter.

GARRETSEN (A. J.). **Enkele aanteekeningen over groenbemesters in verband met ziekten en plagen.** [Some Notes on Green Manures in connection with Diseases and Pests.]—*De Thee,* vi, no. 3, pp. 77–79, 1 pl. Buitenzorg, September 1925. [Recd. March 1926.]

Like any other crops grown extensively, green manures are susceptible to attack by diseases and pests. In one instance, *Crotalaria anagyroides* was defoliated by a Noctuid, *Phytometra* (*Plusia*) sp., and had to be cleared to prevent the infestation spreading to the tea. This Noctuid is normally a pest of tobacco and maize. Though *Helopeltis* punctures *C. anagyroides,* it does not oviposit on it.

MENZEL (R.). **Iets over de in** *Helopeltis* **parasiteerende Mermithiden.** [Some Notes on the Mermithids parasitising *Helopeltis.*]—*De Thee,* vi, no. 3, pp. 80–81, 1 pl. Buitenzorg, September 1925. [Recd. March 1926.]

Though the parasitism of *Helopeltis* by Mermithids is not a matter of practical value in the Dutch East Indies [*R.A.E.*, A, xiv, 144], details are given owing to the economic importance of such parasitism n some other insects.

NEWMAN (L. J.). **The Red Legged Earth Mite,** *Penthaleus destructor* **(Jack).**—*Jl. Dept. Agric. Western Australia*, ii, (2nd Ser.), no. 4, pp. 469–475, 6 figs. Perth, December 1925.

This account of *Penthaleus destructor*, Tucker, is largely the same as in papers previously noticed, in which this mite was erroneously recorded as *Notophallus bicolor*, Frogg. [*R.A.E.*, A, xi, 571 ; xiv, 50].

NEWMAN (L. J.). **Fruit Fly,** *Ceratitis capitata* **(Wied.).**—*Jl. Dept. Agric. Western Australia*, ii, (2nd Ser.), no. 4, pp. 489. Perth, December 1925.

By Regulations under the Plant Diseases Act, 1914–25, in orchards where *Ceratitis capitata* occurs a bait-spray must be applied consisting of 5 oz. lead arsenate paste or 2½ oz. dry lead arsenate, 4 lb. molasses, 1 gal. fruit syrup (orange for preference) and 3 gals. water, at the rate of not less than 1 gal. to 80 trees. All fallen fruits must be gathered at least once every 24 hours ; and all infested fruit must be gathered from the ground and trees once every 24 hours and destroyed by boiling. In commenting on this, the author remarks that, if possible, infested fruit should not be allowed to lie exposed to the hot sun, as it causes the larvae to bury themselves in the soil before the fruit is collected.

NEWMAN (L. J.). **Locusts,** *Chortoicetes terminifera* **(Walker).**—*Jl. Dept. Agric. Western Australia*, ii, (2nd Ser.), no. 4, pp. 503–504. Perth, December 1925.

During the summer of 1925 *Chortoicetes terminifera*, Wlk. [*R.A.E.*, A, xii, 411] migrated into new areas in search of the green growth in the stubbles produced by the unusual rains that occurred in February and March. Young hoppers can be destroyed by spraying with 1 lb. sodium arsenite or sodium arsenate, 4 lb. molasses and 16 gals. water. This kills by direct contact and by coating the insects' food with poison. As the hoppers grow older, the water should be reduced to 12 gallons, but this must not be applied to green crops, as it scorches the foliage. The most effective bait was 30 lb. bran, 1 lb. sodium arsenite, sodium arsenate or Paris green, and 4 lb. molasses with sufficient water to mix into a stiff mash.

CLARK (J.). **Forest Insects. The Marri Borer** (*Tryphocharia hamata*).—*Jl. Dept. Agric. Western Australia*, ii, (2nd Ser.), no. 4, pp. 513–517, 5 figs. Perth, December 1925.

It has been ascertained that *Tryphocharia hamata* is not responsible for the gum veins in *Eucalyptus calophylla* [*cf. R.A.E.*, A, x, 630]. This longicorn feeds on various species of *Eucalyptus* in all stages of growth, but shows a preference for young trees about a foot in diameter. The eggs are deposited in small cracks of the bark, to which they are attached by a gummy substance. The larva eats its way through the bark in a spiral direction, and gradually works through the sapwood until it is strong enough to penetrate the hard wood. It then continues an erratic course upwards, occasionally boring into the sapwood on various sides of the tree, for from 8 to 12 feet, and when full-grown it excavates a broad channel between the hard wood and the bark. The actual pupal chamber is bored downwards from this channel for about 9 to 12 inches in the hard wood. This chamber is made during

April or May, and the larva remains in it, but does not pupate until October or November, the adults emerging during December and January. It is generally about 15 feet from the ground. Many of the larvae are parasitised when they bore into the sapwood on their upward course. The galleries stop at this point, and only the larval skins are found. Braconids have been seen around the infested trees. Black cockatoos (*Calyptorhynchus* sp.) attempt to reach the larvae and frequently complete the destruction by girdling the tree. A brief description is given of the adults and the egg.

FRENCH, Jr. (C.) & HAMMOND (A. A.). **Apple Root Borer** (*Leptops hopei*). **Control Experiments.**—*Jl. Dept. Agric. Victoria,* xxiv, pt. 1, pp. 25–29. Melbourne, January 1926.

Various chemicals and explosives have been tried for the control of the larvae of *Leptops hopei* in the subsoil. The only satisfactory results were obtained with sulpho-carbonate of potassium applied in the winter. The strength of the solutions varied from 1½ to 3 per cent., and the quantity per tree from 8 gallons in the winter to 36 in the summer. In spite of the much larger quantities used, the summer treatments proved quite ineffective. Only dead and discoloured larvae were found round the trees treated in the winter. The strength of the stock mixture was 28° Bé., 11 per cent. carbon bisulphide.

BATES (G.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.,* xxv, pt. 1, pp. 4–5. Brisbane, 1st January 1926.

Mastotermes darwiniensis, Frogg., is a common pest of sugar-cane in sandy soil in one district, but excellent results against it have been obtained with arsenic, caustic soda, and molasses baits [*R.A.E.,* A, xiii, 522]. Cane sets were dipped in dehydrated tar and allowed to drain before planting ; this treatment gave fairly efficient protection from the termites, but seriously hindered germination. Larvae of *Lepidoderma albohirtum,* Waterh. (grey-back cane-beetle) have done considerable damage in one locality in the same district. One of the principal food-plants of the adults is the black palm [*Areca normanbyi* ?] ; these large trees should be cut down so as to drive the beetles to others from which they can be more easily collected.

JARVIS (H.). **Fruit Fly and other Orchard Pests in the Stanthorpe District.**—*Queensland Agric. Jl.,* xxv, pt. 1, pp. 10–13. Brisbane, 1st January 1926.

Periodical examinations of cages erected over fruit trees have again shown almost conclusively that *Dacus ferrugineus,* F. (*Chaetodacus tryoni,* Frogg.) does not pass the winter in the pupal stage in the soil in the Granite Belt [*cf. R.A.E.,* A, xiii, 115]. At the end of October a visit was made to northern New South Wales to investigate the wild fruits that might serve as food-plants for fruit-flies. The only infested fruits found were berries of the cheesewood tree (*Acronychia laevis*), which contained larvae of a fruit-fly, possibly a variety of *D. ferrugineus.* The author is, however, of the opinion that the potentialities of wild fruits as a source of fruit-fly infestation are very great [but *cf. R.A.E.,* A, xiv, 127]. *Aphelinus mali,* Hald., has appeared in some, but not all, of the orchards in which it was introduced against *Eriosoma* *lanigerum*, Hausm. (woolly apple aphis) during 1924–25; the first adults observed after the winter appeared at the end of August. Attempts are being made to utilise *A. mali* against the black citrus aphis [*Toxoptera aurantii*, Boy.] and the black peach aphis (*Myzus* sp.). Experiments with paradichlorobenzene against the last-named Aphid on the roots of peach, although disappointing, have indicated that this substance may be of some value in controlling it. The weevil, *Orthorrhinus cylindrirostris*, F., has been found damaging grape-vines and young apple branches; it has also been found in native timber. It is unlikely to become a pest of either grape-vine or apple, and spraying with lead arsenate should control it effectively. *Aspidiotus rapax*, Comst. (*camelliae*, Sign.) (greedy scale), is recorded from pear, which is believed to be a new food-plant for this species. It can be controlled by the same means as *A. perniciosus*, Comst. (San José scale), but more readily, and it is less injurious, as it does not inject a poison into its food-plant while feeding.

BALLARD (E.). **The Pink Boll Worm** (*Platyedra gossypiella* **Saunders).**—*Queensland Agric. Jl.*, xxv, pt. 1, pp. 23–30, 6 figs. Brisbane, 1st January 1926.

This account of the bionomics and control of *Platyedra gossypiella*, Saund., is a reprint of a pamphlet written for circulation in Papua and the mandated territory of New Guinea. It is not known whether *P. gossypiella* is indigenous there, but it is present around Rabaul, where it has probably been introduced since 1912, and in the dry belt, 50 miles east and west of Port Moresby. In New Guinea cotton flowers throughout the year, but it is essential for the control of *P. gossypiella* that the plants should be ploughed up at the end of each season, and that there should be a close season of at least two months before the sowing of the next crop. To ensure the destruction of long-cycle larvae, all seed intended for sowing should be heated to 140° F. (but not over 150° F.), either by spreading it out thinly on mats or corrugated iron sheets in the sun, or in machines. Places where cotton is stored for any length of time should be made moth-proof at night by mosquito-netting fixed in place just before sunset.

COTTRELL-DORMER (W.). **Cane Pests and Diseases.**—*Queensland Agric. Jl.*, xxv, pt. 1, pp. 45–47. Brisbane, 1st January 1926.

Serious damage has been caused on one farm by an ant that builds mounds round growing sugar-cane shoots, preventing them from stooling. The young cane roots probably constitute the greater part of the food supply of the ant colonies, as those in the vicinity of the mounds are very much pitted and often lack root-hairs. The natural habitat of the ant seems to be fields of *Imperata arundinacea*, in which it is common in the district. Sweetened poison baits failed to control the pest, and soil fumigation with a mixture of paradichlorobenzene and carbon bisulphide, which has been successfully used against white grubs by one grower, was recommended.

BALLARD (E.). **Cotton Stainers.**—*Queensland Agric. Jl.*, xxv, pt. 1, pp. 53–55, 2 figs. Brisbane, 1st January 1926.

A brief general account is given of the cotton-stainers (*Dysdercus* spp.), which feed on the seeds, and the harlequin bug (*Tectocoris* *lineola*, F.), which feeds on the squares and green bolls of cotton. In a humid climate such as that of New Guinea, even in the dry belts, fungous diseases, which gain entrance to the cotton bolls through the feeding-punctures of these insects, are of great importance [*R.A.E.*, A, xiii, 520]. Heaps of cotton seed placed in the fields may be used to attract *Dysdercus*, which can then be captured and destroyed. *Hibiscus* in the vicinity of cotton fields should also be destroyed. *T. lineola* has not yet become a pest in New Guinea, but it is liable to do so; it can be easily controlled by hand-picking the adults and collecting the egg-clusters.

[VUKASOVIĆ (P.).] **Вукасовић (П.). Biological Notes on Hymenopterous Parasites.** [*In Serbian.*]—*C.R. Acad. roy. Serbe*, no. 119, pp. 9–19, 1 fig., 17 refs. Belgrad, 1926. (With a Summary in French.)

The Proctotrupid, *Trissolcus simoni*, Mayr, parasitises the eggs of *Eurydema ornatum*, L., in any stage of development, and unlike other Hymenoptera it is apparently able to discriminate between infested and non-infested eggs, always choosing the latter for oviposition.

At an average temperature of 22–26° C. [71·6–78·8° F.] its total life-cycle occupies 13–16 days.

[POMERANTZEV (D.).] **Померанцев (Д.). In Defence of our Feathered Friends.** [*In Russian.*]—32 pp., 9 figs. Gomel, Izd. Gomel'sk. Lesn. Tekhnik. [*Publ. Gomel Forest Techn. Inst.*], 1925. Price 45 *kop.* [Recd. March 1926.]

These notes on the life-history of birds, which are the result of 20 years' observations on the stomach contents, emphasise their value in the destruction of insect pests.

[ZVEREZOMB-ZUBOVSKIĬ (E.).] **Зверезомб-Зубовский (Е.). The Granary Weevil and its Control.** [*In Russian.*]—U.S.S.R., N.K.Z. [*Ukraine Nat. Commiss. Agric.*], 14 pp., 8 figs. Kharkov, 1924. [Recd. March 1926.]

This is a popular account of the life-history of the granary weevil [*Calandra granaria*, L.] and its control.

[VASIL'EV (I. V.).] **Васильев (И. В.). Insects injurious to Orchards and their Control.** [*In Russian.*]—U.S.S.R., N.K.Z. [*Ukraine Nat. Commiss. Agric.*], 49 pp., 56 figs. Kharkov, 1924. [Recd. March 1926.]

The life-histories and habits of the more important orchard pests of the Ukraine are discussed under their popular names, with instructions for their control.

[BEL'SKIĬ (B. I.).] **Бельский (Б. И.). Practical Key for the Identification of Dipterous Larvae injurious to Grain Crops.** [*In Russian.*]—U.S.S.R., N.K.Z. [*Ukraine Nat. Commiss. Agric.*], 2nd edn., 24 pp., 2 figs. Kharkov, [1925 ?].

This simplified key has been prepared in order to facilitate a general survey of grain pests in Russia; instructions for making and recording local observations are also given.

[Golovyanko (Z. S.).] **Головянко (З. С.). The Method of Estimating Bark-beetle Infestation of Pines.** [*In Russian.*]—Trud. Lesn. Opuitn. Delu Ukrain. [*Trans. Forest Exptl. Work Ukraine*], pt. 4, 87 pp., 11 graphs, 3 pls., 5 refs. Kiev, 1926. (With a Summary in German.)

Bark-beetle infestation has been steadily increasing in the pine forests of the Ukraine as a result of war conditions and other factors, including forest fires and general neglect. Before any organised campaign could be started it was essential to study the biology of the insects under local conditions and to make a systematic survey of the infested forests. The method employed is described in detail, including an account of a mathematical formula for estimating the extent of infestation.

Myelophilus minor, Hart., is the most abundant species and is found in the upper parts of pines that have " dried out " (a condition not yet fully understood, resulting in the production of suitable conditions for bark-beetle infestation) early in the season. This is particularly the case where the deterioration of the pine stand is prolonged and the " drying out " continues throughout the growing (vegetative) period. In these trees there is practically no room left for *Ips acuminatus*, Gyll., a crown-infesting species, though this beetle infests the trees that reach the " drying out " stage at the end of the flight period of *M. minor*, and in which therefore the latter is entirely absent.

In the trap trees *M. minor* and *M. piniperda*, L., preferred those lying in the shade, whereas *I. sexdentatus*, Börn., and *I. proximus*, Eichh., were most numerous in those lying in clearings ; the latter also prefer the upper side of the logs while the former choose the lower surface.

Large numbers of *M. minor* are destroyed in the standing trees as a result of overcrowding, so that unless the trap logs are taken from these standing trees, the available breeding-places are increased, thereby preventing natural overcrowding and resulting in the production of a greater number of individuals. Though those in the trap logs may be destroyed, the numbers infesting the standing trees have not been thus reduced. Instead of felling the standing infested trees for traps, the same results may be obtained by simply removing the bark before the flight period of this beetle.

[Migulin (A. A.).] **Мигулин (А. А.). The Organisation of the Campaign for the Control of the Italian Locust by means of Poison Baits in the Government of Kharkov in 1925.** [*In Russian.*]—*Protect. Plants Ukraine*, 1925, pt. 3–4, pp. 25–28. Kharkov, 1925. [Recd. March 1926.]

As a result of the survey of breeding-grounds of the Italian locust [*Calliptamus italicus*, L.] in the autumn of 1924 it was decided to organise a campaign over an area of over 30,000 acres, using 21,836 lb. of sodium arsenite. The preparation of the bait and the organisation of the work to be done are described.

[Golovyanko (Z. S.).] **Головянко (З. С.). The Common Mole (*Talpa europaea*) as a Destroyer of Cockchafer Larvae.** [*In Russian.*]—*Protect. Plants Ukraine*, 1925, pt. 3–4, pp. 36–39. Kharkov, 1925. [Recd. March 1926.]

There is a difference of opinion as to the value of moles in the destruction of insect pests. A great proportion of cockchafer larvae was found in a number of stomachs examined, the species depending on the locality in which the moles were taken. The food of these animals evidently varies both according to locality and season.

[SHIPEROVICH (V. Ya.).] **Шиперович (В. Я.). A Sawfly injurious to Pine and its Control.** [*In Russian.*]—*Protect. Plants Ukraine,* 1925, pt. 3–4, pp. 41–46. Kharkov, 1925. [Recd. March 1926.]

In recent years sawflies have caused considerable damage in pine plantations throughout the Ukraine, the most harmful being *Diprion* (*Lophyrus*) *sertifer,* Geoffr. The larvae, which appear in May and June, are ready to spin their cocoons amongst the forest litter after 5 weeks; the pupal stage lasts from 2 to 3 weeks, and the adults emerge in August and September and lay their eggs in the needle shoots of the same year. The winter is passed in the egg stage, there thus being one generation in the year. A biological race, however, occurs in which the winter is passed in the cocoon, the adults emerging from May to the middle of July. These lay their eggs at once, and the larvae hatch after 2 weeks. They feed for 4-6 weeks on the needles and hibernate in the cocoon. The two races also exhibit morphological differences. They are seldom both met with in the same locality, though it is possible for both to be produced from the same egg-mass, and this has been shown to be due to hybridism. Neither temperature nor humidity nor even food is able to influence the production of either race.

A large number of the larvae are destroyed by a bacterial disease due to *Bacillus septicaemiae lophyri.* The only remedial measure to be recommended is the collection and burning of all forest litter with the cocoons. This, to be effective, must be done as soon as the larvae disappear from the trees, in June and July or between September and May. The collection of the cocoons is very important among young pine seedlings, particularly in the case of recent infestations without any sign of parasitism or bacterial disease. Whether such work is justified in older stands will have to be decided by further observations, which are now in progress.

[FILIP'EV (I. N.).] **Филипьев (И. В.). The Common Dart Moth in 1924.**

[TELESHEK (V.).] **Телешек (В.). The Common Dart Moth in the Ukraine in 1924.**

[VAL'KH (B. S.).] **Вальх (Б. С.). The Common Dart Moth in the Donetz Government during the Season of 1924.**

[TELESHEK (V.).] **Телешек (В.). The Distribution of the Common Dart Moth in the Ukraine in 1925.** [*In Russian.*]—*Protect. Plants Ukraine,* 1925, pt. 3-4, pp. 46–47, 48–50, 51–53, & 55–57. Kharkov, 1925. [Recd. March 1926.]

Euxoa (*Agrotis*) *segetum,* Schiff., was unusually abundant during the autumn of 1924 in various districts of the Ukraine, causing considerable injury to various vegetable crops. In the Donetz region it was found that trap trenches were more effective when they were made with a sloping wall on the side of the infested field and a steep wall only on the side of the field to be protected. When both sides were steep the larvae would cross the trenches even when these were 28 inches deep. Good results were obtained in many places by ploughing and resowing.

As a result of tests made in various localities to ascertain to what extent the larvae are surviving, a heavy infestation may be expected in 1925.

[KAMUISHNUIĬ (N. S.).] **Камышный (Н. С.). Important Notes.** [*In Russian.*]—*Protect. Plants Ukraine,* 1925, pt. 3–4, pp. 53–55. Kharkov, 1925. [Recd. March 1926.]

Hylesinus fraxini, Panz., though usually unimportant as a pest of ash trees, caused considerable damage in 1924 in certain forests of the Ukraine. This was mainly due to the proximity of stored infested timber. As a rule the injury only results in slight abnormalities in definite parts of the tree, but in the present infestation the winter galleries were so numerous that the infested trees had to have the bark removed.

Elm trees in the same stand were heavily infested by *Scolytus scolytus,* F., and *S.* (*Eccoptogaster*) *multistriatus,* Marsh.; these also originated from stored logs.

[ZNAMENSKIĬ (A. Z.).] **Знаменский (А. З.). Reports on the Incidence of Field Pests on 5th May and 20th May, 1925.**

[NIKITIN (I. V.).] **Никитин (И. В.). The Incidence of Pests according to the Ivanovsk Experimental Station, 5th May 1925.** [*In Russian.*]—*Protect. Plants Ukraine,* 1925, pt. 3–4, pp. 58–59, 59–65 & 65. Kharkov, 1925. [Recd. March 1926.]

Notes are given on the seasonal appearance of some common insect pests in certain districts of the Ukraine, recorded under their popular names.

[DEKHTYAREV (N. S.).] **Дехтярев (Н. С.). A Comparison of the Morphology of the Immature Stages of *Euxoa segetum,* Schiff., and *Feltia exclamationis,* L.** [*In Russian.*]—*Protect. Plants Ukraine,* 1925, pt. 5–6, pp. 45–50, 5 figs., 3 refs. Kharkov, 1925. [Recd. April 1926.]

The eggs, larvae and pupae of *Euxoa segetum,* Schiff., and *Feltia exclamationis,* L., are described, and the differences between them are pointed out.

[LUK'YANOVICH (F. K.).] **Лукьянович (Ф. К.). On the Appearance of the Asiatic Locust in the District of Priluki, Government of Poltava.** [*In Russian.*]—*Protect. Plants Ukraine,* 1925, pt. 5–6, pp. 51–53, 2 refs. Kharkov, 1925. [Recd. April 1926.]

Swarms of *Locusta migratoria,* L., which appeared in 1924, laid their eggs very sporadically in two areas; but no damage was recorded from the ensuing larvae, which were scattered and belonged to the solitary phase, ph. *danica*, L.

The egg-masses were sometimes destroyed by the larvae of the wireworm, *Athous niger* L., and some egg-parasites of the genus *Scelio* were also bred from them.

[DEKHTYAREV (N. S.).] **Дехтярев (Н. С.). Combating the Common Dart Moth by trapping the Adults with Fermenting Molasses.** [*In Russian.*]—*Protect. Plants Ukraine*, 1925, pt. 5–6, pp. 54–66, 3 figs., 13 refs. Kharkov, 1925. [Recd. April 1926.]

Extensive experiments have been made with traps of molasses for the control of *Euxoa segetum* [*R.A.E.*, A, ii, 469] in the Government of Poltava. Though this method is very effective, it is rather expensive under present conditions. A detailed account is given of the number of different insects caught by this method, the parasites of cutworms taken being negligible.

For cutworms the traps should be placed at the sites of infestation of the previous years, in order to catch the adults of the first generation and amongst vegetable crops for the second generation. The addition of lamps did not improve the efficacy of the traps.

[GERASIMENKO (L. R.).] **Герасименко (Л. Р.). Observations on the Life-history of *Calliptamus italicus*, L., and its Control in the Kupyansk District in 1925.** [*In Russian.*]—*Protect. Plants Ukraine*, 1925, pt. 5–6, pp. 66–74. Kharkov, 1925. [Recd. April 1926.]

The hatching of larvae of *Calliptamus italicus*, L., was observed between 15th May and 5th June, and the adult stage was reached in 41–44 days. Young larvae formed compact swarms, but later on these gradually dispersed.

The damage to cultivated plants was negligible, partly because of unfavourable rainy weather, which resulted in an epidemic disease, and partly owing to the control measures. The latter consisted in the use of poisoned baits and were very successful. The baits consisted of 15 lb. bran, 25 lb. sawdust, 1 lb. arsenic, and 13 gals. water. The addition of molasses increased the attractiveness of the bait, which decreased in proportion to the relative quantity of sawdust.

[ARKHANGEL'SKIĬ (N. N.). **Архангельский (Н. Н.). Control of Cabbage Worms.** [*In Russian.*]—Sevkavkraĭzu. Kraev. Stanz. Zashchit. Rast. [*Regional Plant Protect. Sta. N. Caucasus*], [Ser. B] no. 7, 7 pp., 4 figs. Rostov-on-Don, 1925. [Recd. April 1926.]

This is a short popular account of the injury caused by the larvae of the cabbage butterfly [*Pieris brassicae*, L.] in the northern Caucasus, with recommendations for its control. The latter include cultural measures and spraying with barium chloride, instructions for which are given.

[Bogdanov-Kat'kov (N. N.).] **Богданов-Катьков (Н. Н.). Insects injurious to Vegetable Crops.** [*In Russian.*]—2nd edn. 112 pp., 137 figs. Leningrad, Muisl, 1926. Price 1 *rbl.*

A general account is given of the various methods of controlling vegetable pests, such as cultural measures and mechanical, chemical and biological control. Some 100 insect pests are dealt with, their popular and scientific names being given, with notes on their bionomics and control where known.

[Ryabov (M. A.).] **Рябов (M. A.). The Possibility of Biological Control of Pests in Storage.** [*In Russian.*]—Sevkavkraizu. Kraev. Stantz. Zashchit. Rast. [*Regional Plant Protect. Sta. N. Caucasus*], Ser. A, no. 7, 36 pp., 2 pls., 10 refs. Rostov-on-Don, 1925. (With a Summary in English.) [Recd. April 1926.]

A detailed study has been made of *Lariophagus distinguendus*, Först., a parasite of *Calandra granaria*, L., and *C. oryzae*, L., as a result of which its propagation for the control of these pests in storage, at least in the northern Caucasus, is advocated. The life-history and habits are described, including a detailed account of oviposition. The females have an unerring instinct for identifying infested grain, being probably guided by both sound and smell. At average daily temperatures of 26–27° C. [78·8–80·6° F.] the life-cycle from egg to adult varied from 18–20 days. The use of this parasite for the control of the weevils should be of particular value where conditions are not suitable for fumigation.

In an appendix a key is given to the species of *Lariophagus*, parasitic on grain pests, based on the work of Waterston [*R.A.E.*, A, x, 106].

[Shchegolev (V. N.).] **Щеголев (В. Н.). The Use of Poison Baits in the Control of Tenebrionids.** [*In Russian.*]—Rostovo-Nakhichevansk. na Donu Oblast. S-Kh. Opuitn. Stantz. [*Rostov-Nakhichevan-on-Don Regional Agric. Expt. Sta.*], Bull. 195, 15 pp., 6 figs., 4 refs. Rostov-on-Don, 1925. (With a Summary in English.) [Recd. April 1926.]

Tenebrionid beetles do considerable damage to grain crops in the Don region and probably other parts of the northern Caucasus. The most abundant species are *Platyscelis gages*, Fisch., *Pedinus femoralis*, L., *Opatrum sabulosum*, L., and *Gonocephalum pusillum*, F. [*cf. R.A.E.*, A, xiii, 447].

The chief injury is done to *Sorghum* and wheat, the seed being eaten underground, sometimes resulting in the entire failure of the crop. Poison baits of 40 parts by weight of bran or oilcake, 30 parts of water, and 1 part of an arsenical poison have proved effective. With the first two species sodium arsenite, and with the last two, Paris green gave the best results. As the adults congregate under isolated clumps of weeds, etc., heaps of knot-grass (*Polygonum*) were placed at intervals throughout infested fields of *Sorghum* and maize. Over a period of 10 days 17,251 individuals were thus taken over an area of about 5 acres, the counts being made three times a day. The poison baits can be effectively placed under such heaps, or possibly broadcast, but the latter method has not yet been tried. The best time for application is when the adults appear in large numbers, before the eggs are laid. Observations are being made on the life-history of these beetles in order to ascertain the correct date of application.

[DOVNAR-ZAPOL'SKIĬ (D. P.).] **Довнар-Запольский (Д. П.). Observations on the Biology of** *Calliptamus italicus*, **L. (Report of the Work of 1924).** [*In Russian.*]—Rostovo-Nakhichevansk. na Donu Oblast. S.-Kh. Opuitn. Stantz. [*Rostov-Nakhichevan-on-Don Regional Agric. Expt. Sta.*], Bull. 166, 20 pp., 13 refs. Novocherkassk, 1925. [Recd. April 1926.]

The preferred habitat of *Calliptamus italicus*, L., in the Don province in 1924 proved to be the dry steppes, mainly uncultivated, with a weak growth of *Artemisia* and a few other plants. A full description is given of larvae of different stages, of which there are five in both sexes. Observations on the behaviour of larvae and adults showed that it depends on the temperature of the air. The night is always passed on the twigs of *Artemisia* near the ground or on the ground itself, not on the tops of plants as in other locusts. Only at temperatures over 30° C. [86° F.] do the insects become active and climb the plants, the optimum being 30-40° C. [86–104° F.]. Rain causes *C. italicus* to seek refuge under plants, clods of earth, etc. Insects occur both singly and in loose swarms ; all daily movements of the latter are much more regular than those of isolated individuals, and migrations of larval swarms are not rare. *C. italicus* will eat even absolutely dry vegetable rubbish, or corn stubble. Later in the season, when the steppes are scorched by the sun, this locust migrates into the river valleys.

Natural enemies are : Hedgehogs ; many birds ; and the wasps, *Sphex subfuscatus*, Dahlb., and *S. albisectus*, Lep., which prey upon the adults, and *Tachytes obsoleta*, Rossi, which attacks the larvae. Long-horned grasshoppers of the genus *Metrioptera* (*Platycleis*) also prey upon them, and the Mantid, *Bolivaria brachyptera*, Pall., feeds on them regularly. A mite, *Trombidium* sp., was a common external parasite.

Experiments with poisoned baits showed that they attract swarming individuals better than solitary ones.

[PLOTNIKOV (V. I.).] **Плотников (В. И.). Insects injurious to Agricultural Plants in Central Asia.** [*In Russian.*]—Uzbekstansk. Opuitn. Stantz. Zashch. Rast. [*Uzbekstan. (Turkestan) Expt. Sta. Plant Protect.*], 292 pp., 227 figs. Tashkent, 1926. Price 5 *rbl.*

This is a second and amplified edition of a book previously noticed [*R.A.E.*, A, ii, 713]. It contains records of some 115 additional insects, with recommendations for their control.

A table of Russian, metric and English measures is appended.

METALNIKOV (S.). & CHORINE (V.). **Du rôle joué par les Hyménoptères dans l'infection de** *Galleria mellonella*.—*C.R. hebdom. Acad. Sci.*, clxxxii, no. 11, pp. 729–730. Paris, 15th March 1926.

Cultures made from larvae of *Galleria mellonella*, L., that had died as a result of some disease showed the presence of three micro-organisms, all of which could be isolated in pure cultures. The inoculation of any or all of these killed the larvae, but they could not be infected by any other means. It was proved experimentally that the disease is conveyed to the larvae by the Chalcid, *Dibrachys boucheanus*, Ratz.

The adults puncture the larvae and suck their blood, and they die 24–48 hours later. The adult parasites then lay their eggs on them, and the resulting larvae feed on the dead larvae of the host. The parasite has a life-cycle of 20 days.

Boucley (—) & Delassus (—). **Recherches sur les effets produits chez nos animaux domestiques par l'emploi des grains et des graines traités par le paradichlorobenzene ou chloryl.**—*C.R. Acad. Agric. France,* xii, nos. 10 & 11, pp. 330–331 & 366–370, 4 refs. Paris, 10th & 17th March 1926.

Experiments are described in which certain domestic animals (a sheep, a pig, a rabbit, a fowl and a cow) were fed on food containing barley that had been treated with paradichlorobenzene. It was found that food treated with even excessive doses (about 1 lb. per 35 cu. ft. of store space) of the insecticide caused no injury to the animals, but its use produced a slightly noticeable effect on the flavour of the milk from the animals and a quite marked one on that of the flesh. The time that must elapse after using the treated food in order to eliminate this flavour has not yet been determined; it was still present in animals killed a fortnight after being fed on treated fodder. The consumption of such meat or milk is, however, quite innocuous.

Marchal, commenting on this paper, records that in the course of experiments made by P. Vayssière & Leroy, a hen was exposed for 6 to 8 hours to an atmosphere saturated with paradichlorobenzene vapour. The treatment was efficacious in killing parasites and the hen did not suffer, but the eggs laid by it for a month retained an odour and taste that prevented their use as food.

Moreau (L.) & Vinet (E.). **La lutte contre la cochylis et l'eudémis. Comment réduire en nombre et en importance les grandes invasions.** —*C.R. Acad. Agric. France,* xii, no. 12, pp. 400–404. Paris, 24th March 1926.

As a result of many years' experiments with remedies against the vine moths [*Clysia ambiguella,* Hb., and *Polychrosis botrana,* Schiff.], lead arsenate, nicotine, and pyrethrum-soap have become the favourite insecticides for use on vines, and of these lead arsenate has proved the most popular. On experimental plots, as much as 80 to 95 per cent. mortality has been obtained against larvae of the first generation, while the resulting wine has been proved to contain no more than the normal trace of arsenic. When used on a large scale, however, the results have not always been so good, generally owing to faulty application or timing, and when a season of heavy infestation has occurred, growers have become discouraged and have given up spraying in despair. When the grapes are visible and easy to reach they are small and undeveloped and would retain very little spray, while hatching of the larvae has scarcely begun; as soon as the grapes present a large surface for insecticidal treatment and hatching of larvae is at its height, the leaves screen the fruit and hinder spray application unless they are first removed. Two treatments with an interval of 10 or 15 days have given the best results, but even then the mortality does not exceed 50 or 60 per cent. for the spring generation. Summer sprays are even more difficult because of the heavy foliage.

It is recognised that the ideal remedy has not yet been found, but in the meantime the best use should be made of the measures at hand. At present vineyards are only treated thoroughly after a series of years of heavy infestation, with the result that the proportion of the crop saved by spraying does not always compensate for the cost. Treatment should be made every year, even during very light infestation, with the object of gradually reducing the number of moths, so that heavy infestations are much less likely to occur.

FABRE (—) & BREMOND (—). **Essais de traitements arsénicaux réalisés durant l'année 1925 à l'Institut agricole d'Algérie.**—*C.R. Acad. Agric. France,* xii, no. 12, pp. 385–389. Paris, 24th March 1926.

Experiments carried out in Algerian vineyards in 1925 for the purpose of testing the causticity of various insecticidal substances used on the vines were not very successful owing to unusually heavy rains washing off the insecticides before their effect could be marked. The general conclusions reached, however, were that soluble arsenical salts are decidedly caustic at the ordinary doses considered necessary for the destruction of insect pests. Insoluble arsenical salts, such as lead or calcium arsenate, do not scorch the plants at the ordinary dosages used in agricultural practice, but the latter must have been washed during the process of manufacture in order to separate the caustic alkaline substances produced by the reaction of the lime with the sodium arsenite. The insecticidal results obtained with such calcium arsenate were as good as those obtained with lead arsenate or with soluble arsenical compounds, and the former is distinctly cheaper.

HODSON (W. E. H.) & BEAUMONT (A.). **Second Annual Report of the Department of Plant Pathology for the year ending September 30th, 1925.**—*Seale-Hayne Agric. Coll.*, Pamphlet no. 19, 32 pp. Newton Abbot, Devon, 1926.

Aphelinus mali, Hald., persisted in 1925 in the orchard in Cornwall into which it had been introduced in 1924 [*R.A.E.*, A, xiii, 321], but did not increase appreciably and failed to control the woolly apple aphis [*Eriosoma lanigerum*, Hausm.]. Potatoes, especially near hedge rows, were seriously damaged by *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.), which caused wilting of the top shoots in many cases. *Pegomyia hyoscyami*, Panz. (mangel fly) was more than usually abundant, but did not become generally prevalent until rather late, and consequently did not cause very severe injury. A leafhopper, *Erythroneura* (*Zygina*) *parvula*, Boh., is assuming importance as a pest of tomatos under glass; in one greenhouse it was found to be over-wintering on dog's mercury (*Mercurialis perennis*); it would probably be controlled satisfactorily by two fumigations with hydrocyanic acid gas, although one fumigation was not sufficient, as the eggs were not affected. *Aleurodes brassicae*, Wlk., is abundant on wild cabbage in South Devon and becomes a serious pest when established on cultivated crops; *Trialeurodes* (*A.*) *vaporariorum*, Westw., breeds freely in the open during the summer, damaging runner beans, herbs, etc. *Heterodera radicicola*, Greef (root-knot eelworm) is a serious pest of tomatos and beans grown under glass. Strawberries, especially when grown in recently cleared woodland, have been very liable to attack by larvae of *Melolontha melolontha*, L.

(*vulgaris*, F.) ; the larvae should be dug out where plants show signs of attack, as a single individual may kill a number of plants. *Anthonomus pomorum*, L. (apple-blossom weevil) again did considerable damage, but was not so abundant as in 1924, perhaps owing to a high percentage of the larvae having been parasitised in that year. *Pteronus* (*Nematus*) *ribesii*, Scop. (gooseberry sawfly) was exceedingly plentiful, often causing complete defoliation or even death of the bushes where spraying with lead arsenate was not carried out in May. *Contarinia* (*Diplosis*) *pyrivora*, Riley (pear midge) was again very injurious, especially to early-flowering varieties. *Cydia pomonella*, L. (codling moth), on apple, *Anuraphis helichrysi*, Kalt. (*prunina*, Wlk.) and *Hyalopterus arundinis*, F. (*pruni*, F.), on plums, and *Eriophyes ribis*, Nal., on black currants, were very prevalent. Spraying in February with a tar distillate wash gave excellent control over the plum Aphids, particularly *A. helichrysi*, unsprayed trees in the same orchards being heavily attacked. Hand-picking of swollen buds in winter and systematic spraying with lime-sulphur serve as efficient checks for *E. ribis*. *Eriophyes pyri*, Pagst., is widely distributed on pears in South Devon, often causing premature defoliation and ruining the fruit.

Oscinella (*Oscinis*) *frit*, L. (frit fly), of which the summer broods were particularly abundant, caused severe damage to late-sown spring oats, though black oats showed hardly any attack in the ear.

The Chloropid fly, *Centor myopinus*, Mg., was found damaging oats in May, causing the plants to die off in patches. The larvae tunnel in the tillers and destroy the growing points, one usually being present in each ; they feed for several weeks and then pupate, almost invariably in the bases of the damaged tillers at about soil level ; none was observed to leave the plants. The adults emerge about 14 days later. Oats are also injured by an eelworm, *Cephalobus* sp. ; the larval stage infests the seed taken from attacked plants, and the Nematodes appear in plants grown from such seed.

Very serious damage to various crops, particularly barley, oats, and strawberries, was caused by larvae of the crane-flies, *Tipula oleracea*, L., and *T. paludosa*, Mg., in the spring. In fields of young cereals 95 per cent. control was obtained by the application of 2 cwt. naphthaline per acre ; this method was not, however, satisfactory on strawberry beds, where good results were obtained with poison baits consisting of Paris green 1 lb., bran 25–30 lb., and water 1 gal. One application of this bait gave 65 per cent. control, and a second 10 days later almost complete control. This bait is much cheaper than naphthaline and has the additional advantage of killing slugs.

In 1924 a severe attack of the Capsid, *Lygus pabulinus*, L., in a large plantation of black currants caused defoliation and loss of the crop. In May 1925 the bushes were sprayed, some with 1 lb. 40 per cent. nicotine sulphate and 5 lb. soft soap in 100 gals. water, and some with 8 oz. 98 per cent. nicotine and 10 lb. soft soap or 2 gals. paraffin in 100 gals. water. These sprays, which were applied at a pressure of about 85 lb. per square inch, destroyed all the nymphs present, and a good crop of fruit was obtained. Later in the season, however, the bushes again became infested from the shrubs and herbage on an adjacent river bank, which was doubtless also the original source of infestation. The spray containing paraffin was difficult to mix, and did not spread well on the foliage.

Tylenchus dipsaci, Kühn (stem and bulb eelworm) and *Rhizoglyphus echinopus*, F. & R. (*spinitarsus*, Can.) (bulb mite) were found in

Narcissus bulbs. *Eumerus strigatus*, Fall. (small bulb fly) is very abundant and injurious to these bulbs in South Devon and in the Scilly Islands ; in most cases the winter is passed in the larval or pupal stage in or around the bulbs, although some adults emerge in the late summer and autumn. *Merodon equestris*, F. (large bulb fly) causes considerable injury to *Narcissus* in Cornwall ; larvae have been found in bulbs in February, but the winter is generally passed in the pupal stage ; the adults begin to appear in March.

A list of pests reported during the year is given, on the lines of the previous year [*R.A.E.*, A, xiii, 321].

MILES (H. W.). **Life History and Control of the Pea Moth,** *Laspeyresia nigricana*, **Steph.**—*Bull. Chamber Hortic.*, iii, pt. 1, pp. 6–9, 1 fig., 3 refs. London, March 1926.

Cydia (*Laspeyresia*) *nigricana*, Steph. (pea moth) is one of the most serious pests of peas, and in 1925 it was studied in Lincolnshire. Meyrick's description of the adult is quoted. In captivity the adults began to emerge during the first week in June, and the first one was captured in the open on 18th June. The moths occur until the middle of August, early July being the time of maximum emergence. The greatest number of moths captured by sweepings on crops other than peas were taken from hedge-side and headland weeds. Eggs were first noticed in the breeding-cages on 18th June and hatched in about 8 days. They were laid indiscriminately on the stems, leaves, sepals and petals. Further examination showed that the sepals were generally preferred for oviposition, though it had formerly been thought that eggs were chiefly laid on the young pods. After a time the larvae leave the sepals and reach the developing pods, where they construct tunnels. The duration of the larval stage was found to be about 22 days. The larvae feed on the young peas within the pods, either making tunnels, which they fill with silk and frass, or eating out channels in the surface of the peas and feeding under cover of a webbing of frass and silk. One or two larvae are generally found in a pod. When fully fed, the larvae leave the pod and pupate in the ground about ½ to 1½ in. below the surface, in oval, silken cocoons. Larvae in captivity spent the winter in the cocoon and pupated in May. Late varieties of peas are generally more attacked than early ones, and packers report as many as 25 per cent. of infested peas in some seasons.

Experiments were made with various spray substances. In the case of peas grown for marketing green, the best results were obtained by spraying with 2 lb. calcium caseinate, 2 lb. lead arsenate powder and 10 oz. nicotine per 100 gals. water, applied on 22nd July. The use of this spray resulted in 30 per cent. of infested pods and 11 per cent. of damaged peas. When the peas grown on the treated plots were threshed, they were again examined ; it was found that the lowest percentage of damage (16 per cent.) was then obtained with 20 lb. powdered derris to 100 gals. of water applied on 22nd July ; the use of a spray of 10 oz. nicotine per 100 gals. water with soap sufficient to lather gave almost equally good results. The percentages of damaged peas harvested from plots sprayed with derris or nicotine show little difference from those observed when the green peas were examined ; it would seem, therefore, that these sprays have a permanent effect. This contrasts with the results obtained on the plot sprayed with caseinate, lead arsenate and nicotine, which gave a lower percentage of green peas damaged but a higher percentage of damage to peas harvested when ripe, possibly indicating that this spray has only a temporary influence on the pest.

P[ARKER] (T.). **Arsenic on Apples.**—*Bull. Chamber Hortic.*, iii, pt. 1, pp. 11–13. London, March 1926.

The Royal Commission on arsenical poisoning found that foodstuffs used for human consumption must not contain more than 0·01 grain of arsenic per lb., and a recent examination has shown that while English apples only bear negligible traces of arsenic on their skins, imported fruit has shown traces of arsenic slightly in excess of 0·01 grain per lb. Imported fruit is probably more highly affected than English owing to differences of treatment due to the influences of climate and locality on the breeding-habits of the insect pests, particularly the codling moth [*Cydia pomonella*, L.]. It has recently been suggested, and unfortunately definitely stated in the press, that arsenic is present in the flesh of the apple and that neither washing nor peeling will entirely eliminate it. It is true that arsenic in very minute doses may be taken up by the roots of the fruit tree in the nutrient solution, but there should be no danger whatever of such contamination ever being sufficiently concentrated to constitute a danger to health. Factors influencing the adhesiveness of arsenicals to sprayed fruit and the amount of deposit remaining on the fruit are the use of a spreader or adhesive substances in the spray, the physical properties of the spray (fineness in state of subdivision of the poison) and the extent of rainfall immediately following spraying operations. If a heavy shower occurs shortly after an application of lead arsenate and caseinate, much of the poison will be washed off, but if there is no rain for a day or two the poison will have adhered firmly and subsequent washing will have little effect, because the alkali used for rendering the casein soluble has dried out. If an apple contaminated with this deposit be washed with water, the deposit is very difficult to remove, vigorous polishing being necessary in order to make any impression. The question of eliminating this danger or reducing it to negligible quantities is a serious one. One measure to be considered is wiping the fruit before packing, but this would prove rather costly. The use of less poisonous insecticides has been investigated, but there are very few materials that are likely to form a suitable substitute for arsenicals. The possibility of attacking *C. pomonella* at some other stage than the larval requires investigation, and in view of recent experiences with tar oil distillates such as anthracene oil as egg-destroying sprays, it would appear desirable to exploit the ovicidal properties of this type of spray against *C. pomonella*. Close inspection and analysis at the port of entry might be arranged by the Ministries of Agriculture and Health and the Port Medical authorities.

This paper concludes with a summary of the conclusions reached by Cook & McIndoo in their study of the chemical, physical and insecticidal properties of arsenicals [*R.A.E.*, A, xi, 551].

RICHARDS (O. W.). **A Note on a Dipterous Parasite of Ladybirds.**—*Ent. Mo. Mag.*, lxii, p. 99. London, April 1926.

Previous authors have recorded Phorid flies of the genus *Phalacrotophora* as feeding on the pupae and larvae of Coccinellids, the eggs being laid between the legs of the pupae.

In Surrey *P. fasciata*, Fall., has been found sucking the pupa of *Adalia bipunctata*, L. A pupa of this Coccinellid and another, probably of *Mysia oblongoguttata*, L., produced several of these Phorids.

HERING (O.). **Die Blattminen der Rosen.** [Leaf-mines of Roses.]—*Anz. Schädlingsk.*, ii, nos. 2–3, pp. 13–15, 29–32, 7 figs. Berlin, February & March 1926.

The leaf-miners of roses that occur in Germany include the fly, *Agromyza spiraeae*, Kalt., and the moths, *Nepticula fletcheri*, Tutt, *N. anomalella*, Goeze, *N. angulifasciella*, Staint., *N. centifoliella*, Zell., *Tischeria angusticolella*, Zell., *Coleophora gryphipennella*, Bch., and *C. scolopiphora*, sp. n. The last-named has hitherto been confused with *C. gryphipennella*. The various forms of injury are shown in a table, enabling the species concerned to be identified, and further notes on the injury and a brief account of the biology are given for each species.

ECKSTEIN (K.). **Zur Bekämpfung des Hausbocks** (*Hylotrupes bajulus* **L.).** [Measures against *H. bajulus*.]—*Mitt. Ges. Vorratsschutz*, ii, no. 2, pp. 14–15. Berlin, March 1926.

This is mainly a summary of a paper already noticed [*R.A.E.*, A, ix, 29]. Further experiments show that soaking the timber in arsenical solutions confers protection against *Hylotrupes bajulus*, L., provided that they are allowed to penetrate sufficiently deeply.

ZACHER (F.). **Korn-, Reis- und La Plata- Maiskäfer.** [*Calandra granaria*, *C. oryzae* and *C. zea-mais*.]—*Mitt. Ges. Vorratsschutz*, ii, no. 2, pp. 15–19. Berlin, March 1926.

This paper has been noticed from another source [*R.A.E.*, A, xiii, 574].

ECKSTEIN (K.). **Ueber die Methoden neuzeitlicher Massregeln gegen Insektenschäden im Walde.** [On the Methods of Modern Measures against Damage by Insects in Forests.]—*Anz. Schädlingsk.*, ii, nos. 1–3, pp. 5–8, 15–19, 32–33, 13 refs. Berlin, January–March 1926.

In order to ascertain the species of pests causing injury in forests, their abundance and importance, the practice of taking samples is a reliable guide. The fumigation of the crowns of trees brings down the pests lodged there and enables the species and numbers concerned to be ascertained. Banding applied to the trunk of a fumigated tree yields information about any species seeking to re-infest the tree by climbing up. To ascertain the quantity of needles devoured by pests of coniferous trees, a tree should be felled immediately after fumigation, and the needles should be picked off and weighed. The amount of food required by an individual being known in the case of several species it is possible to predict the probable extent of an impending outbreak of a pest by counts of eggs, parasites, etc., and by making due allowance for the number of needles available, to decide the amount of damage to be expected. Pines retain their needles for three years, and one year's supply of needles suffices to maintain a pine. In the case of a single attack by the pine moth [*Panolis flammea*] less than one-third of its normal amount of needles is sufficient for the pine; in the case of repeated attacks very careful investigation and consideration become necessary.

KRAUSSE (A.). **Entomologische Mitteilungen. 23. Ueber** *Camptozygum pinastri maculicollis* **Mls.**—*Zeitschr. Forst- u. Jagdw.*, lv, pp. 174–175, 1925. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxvi, no. 15–21, p. 444. Jena, 6th March 1926.)

The Capsid, *Camptozygum pinastri maculicollis*, Mls., is recorded as injuring pines in Pomerania, by puncturing the bases of the needles, which become discoloured and break off.

BÄUMLER (N.). **Erfolge in der Heu- und Sauerwurm-bekämpfung 1925.** [Successes in Work against the Spring and Summer Generations of the Vine-moths in 1925.]—*Weinbau u. Kellerwirtsch.*, iv, pp. 202–203, 1925. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxvi, no. 15–21, p. 463. Jena, 6th March 1926.)

In the vine-growing districts of Germany the flight of the vine-moths [*Clysia ambiguella* and *Polychrosis botrana*] in 1925 began before 20th May. Up to 95 per cent. of this spring generation was rendered harmless by intensive spraying and dusting between 20th and 28th May. The insecticide used was a 1 per cent. Bordeaux mixture to every 100 gals. of which 1½–2 lb. of Urania green and 5 lb. resin soap had been added. The flight of the second generation began on 13th–15th July, and the author found that Sturm's preparation of arsenic, Urania green dust, or a 2 per cent. Bordeaux mixture with the addition of 3 lb. Urania green, all gave excellent results. The removal of infested grapes on 1st and 4th August again proved of great value.

BÖNING (K.). **Die Runkelfliege.** [The Beet-fly.]—*Westdtsch. Landw.*, 1924, no. 9. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxvi, no. 15–21, p. 469. Jena, 6th March 1926.)

An account is given of the damage done to beet by *Pegomyia hyoscyami*, and of its control. The Hymenopterous parasite, *Opius nitidulator*, is the principal natural enemy of the late generations.

PFEIFFER-HOFLÖSSNITZ (—). **Die Bekämpfung der Spargelschädlinge.** [The Control of Asparagus Pests.]—*Die kranke Pflanze*, iii, no. 3, pp. 47–49. Dresden, March 1926.

Notes are given on the asparagus fly [*Platyparea poeciloptera*] and the asparagus beetle [*Crioceris asparagi*], and the usual methods of control are described.

BAUNACKE (—). **Der Stachelbeerspanner.** [The Gooseberry Moth.]—*Die kranke Pflanze*, iii, no. 4, pp. 71–72, 1 fig. Dresden, April 1926.

If *Abraxas grossulariata*, L., becomes numerous on gooseberries and other bush-fruits, poultry should be allowed amongst them. In winter the caterpillars may be destroyed by burning the dead leaves beneath the bushes, among which they hibernate.

HERING (M.). **Minenstudien vii.**—*Zs. Morphol. Oekol. Tiere*, Abt. A. v, no. 3, pp. 447–488, 20 figs., 14 refs. Berlin, 5th March 1926.

This further paper [*cf. R.A.E.*, A, xiii, 17, 465] on leaf-mines deals with insects obtained by breeding. A few new species are described, but they are not from plants of economic importance.

PRELL (H.). **Ueber den Brutparasitismus eines deutschen Rhynchitinen und seine Bedeutung.** [Brood Parasitism by a German Species of *Rhynchites* and its Significance.]—*Zool. Anz.*, lxv, no. 11–12, pp. 281–288, 9 refs. Leipzig, 20th February 1926.

Zavadski discovered that *Rhynchites sericeus*, Hrbst., lays its eggs in the leaves rolled by *Attelabus nitens*, L., and the author gives a detailed description of the oviposition habits of this weevil. It has been found only to attack oak leaves rolled by *A. nitens*, not those infested by other species of *Attelabus*. On account of its peculiar habits and structural characters, a new genus, *Coccygorhynchites*, is erected for it.

SCHNEIDER-ORELLI (O.) & LEUZINGER (H.). **Untersuchungen über die virginoparen und sexuparen Geflügelten der Blutlaus des Apfelbaumes.** [Researches on Alatae of the Woolly Apple Aphis that produce Parthenogenetic and Sexual Forms.]—*Vierteljahrsschr. naturf. Ges. Zürich*, lxxi, Beiblatt no. 9, 84 pp., 19 figs., 3 pls., 69 refs. Zurich, 1926.

These investigations on *Eriosoma lanigerum*, Hsm., were made between 1913 and 1925, some of the earlier work having been already noticed [*R.A.E.*, A, ii, 152; iii, 387]. Their object was to ascertain the importance of the alatae in the spread of this Aphid under European conditions, in which *Ulmus americana* (the alternative food-plant in North America) is either absent or rare. As *E. lanigerum* was imported into Europe from North America towards the end of the eighteenth century, and as sexual reproduction is impossible owing to the absence of the food-plant of the winter-egg generation, it is obvious that reproduction in Europe has been parthenogenetic only.

All alatae that produce sexuales without a proboscis are, therefore, unimportant as regards the active spread of *E. lanigerum* in Switzerland, their progeny being unable to reproduce on apple. The authors found, however, confirmation of previous observations by Lichtenstein, Lignières and Thiele, that two different kinds of alatae occur on the apple. The commoner type produces sexuales, without a proboscis, but a second and scarcer type produces young with a long proboscis, which feed on apple just as the progeny of the ordinary apterous individuals do, and which reproduce parthenogenetically.

These alatae of the second type were found in nearly all cases where alate Aphids occurred. They were most abundant from early June to the end of July, but individuals were noticed up to late autumn. The sexuparous alatae (which in North America migrate from the apple to *Ulmus americana*, and which in Europe are unimportant) develop in small numbers in June, and their numbers increase during summer and especially in autumn. The difference between the two types of alatae is only seen in the progeny, as they are the same structurally; further, some individuals can produce both types, and sometimes their progeny include peculiar intermediary forms. Morphological examination shows that the alatae that produce parthenogenetic individuals do not represent a separate generation of the Aphid, but that they are biological transition-types from the apterous parthenogenetic form to the alate sexuparae.

The alatae that produce parthenogenetic forms are unknown in North America, but in Europe they enable the woolly aphis to spread to great distances, whereas spread by wandering young larvae is usually limited to about 100 yards. As the majority of these alatae occur in June and July, an enhanced importance attaches to remedial measures in spring.

WÜNN (H.). **In Elsass-Lothringen vorkommende Schildlausarten (5. Mitteilung).** [Coccids occurring in Alsace-Lorraine (5th Communication).]—*Zeitschr. wiss. Insektenbiol.*, xxi, nos. 1, 2–3, pp. 22–28, 40–50, 1 fig. Berlin, 30th January & 20th March 1926.

This, the final section of a list of Coccids already noticed [*R.A.E.*, A, xiii, 394], also contains notes on Aleurodids, including *Aleurodes asari*, sp. n., from Alsace, on *Asarum europaeum*, and *A. palatina*, sp. n., from the Rhine Palatinate on *Quercus sessiliflora*.

COPLEY (G. H.). **The Pea Weevil.**—*Gard. Chron.*, lxxix, no. 2046, p. 198. London, 13th March 1926.

The pea weevil [*Sitona lineata*] attacks most severely the first early peas, cutting out semi-circular patches from the leaves. For its control the plants, when wet with dew, should be dusted with lime. A dressing of nitrate of soda, 1 oz. to the yard run of drill, will stimulate the plants and enable them to recover from damage quickly. Since the insect is mainly a nocturnal feeder, hiding in the ground by day, some good may be done by pressing the ground firmly with the foot on each side of the drill. Many weevils are imprisoned in this way and die. The ground should be given a dressing of lime, as early as possible, at the rate of 1 cwt. per 100 sq. yards.

BLAXILL (A. D.). **Tetrachlorethane as a Glasshouse Fumigant.**—*Gard. Chron.*, lxxix, no. 2047, pp. 219–220, 2 refs. London, 20th March 1926.

A further list [*R.A.E.*, A, xiv, 185] is given of glasshouse plants that may be safely fumigated with tetrachlorethane.

SANTARELLI (E.). **Le Cocciniglie delle materie coloranti e delle lacche.** [The Coccids producing Colours and Lac.]—*Riv. Agric.*, xxxi, no. 11, pp. 164–166. Rome, 12th March 1926.

This is a brief, popular account of the various Coccids from which dyes or lac are obtained.

WATERSTON (J.). **On a new Trichogrammatid (Hym., Chalcidoidea) Parasite of the Cotton Stemborer** (*Sphenoptera* **sp.**).—*Bull. Ent. Res.*, xvi, pt. 4, pp. 309–313, 2 figs. London, March 1926.

Lathromeris johnstoni, sp. n., reared from the eggs of the Buprestid, *Sphenoptera gossypii*, Cotes, in the Sudan is described. It is found wherever this stemborer of cotton occurs, up to 100 miles south of Khartoum. At least one batch of the eggs of the beetle occurred on *Hibiscus esculentus.*

LEAN (O. B.). **Observations on the Life-history of** *Helopeltis* **on Cotton in Southern Nigeria.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 319–324, 6 refs. London, March 1926.

Helopeltis spp. are minor pests of cotton in Nigeria. Though the figures concerning their life-history were obtained from *H. bergrothi*, Reut., there is no apparent difference between that of this species and of *H. sanguineus*, Popp., which also occurs on cotton. The nymphs of the two species are indistinguishable.

The eggs are buried in the tissues of the stem or leaf. They hatch in 11–16 days, with an average of 12–13. The nymphs are all found on the lower surface of the leaves, more especially on the younger leaves towards the top of the plant. Most of the puncturing occurs on the lower surface of the lamina towards the base of the leaf on the young and succulent leaf-stems. There are five instars, lasting on an average from 3 to 5 days, with a total of 19·5 days.

Cotton appears to be the favoured food-plant in Nigeria; *H. bergrothi* was only found on two other plants, cacao (*Theobroma cacao*) and guava (*Psidium guayava*).

These pests have no doubt many predacious enemies, but the only one observed was the larva of a Syrphid fly, *Xanthogramma pfeifferi*, Big. Only one parasite, a Braconid, *Euphorus* (?) *nigricarpus*, Szép., has been obtained, but both this and the predator are of considerable importance in checking *Helopeltis.* The larvae of the parasite eat their way out of the host during the final nymphal instar and fall to the ground, where they make their cocoon about an inch below the surface of the soil, a habit that is unusual for a Braconid. The adults emerge about 16 days after the larva enters the soil.

It is doubtful whether the present status of *Helopeltis* in Nigeria would warrant any involved system of control, but as it might become of greater importance, the possible remedial measures are reviewed. The propagation of parasites would seem the best available remedy.

BALLARD (E.) & HOLDAWAY (F. G.). **The Life-history of** *Tectocoris lineola*, **F., and its Connection with Internal Boll Rots in Queensland.** —*Bull. Ent. Res.*, xvi, pt. 4, pp. 329–346, 3 pls., 4 figs. London, March 1926.

The injury done to cotton by *Tectocoris lineola*, F., is similar to that of *Dysdercus*, in other cotton growing countries; it does not, however, replace the latter in Queensland, but augments the losses due to it. A description is given of the adult.

The life-history notes were chiefly made on insects confined in cages placed over cotton bushes. Confusion of the four broods was thus successfully avoided, and the conditions approximated very closely to those obtaining in the field.

Under normal summer conditions this bug breeds very slowly, but individuals may live as long as 165 days. It is probably not of very great importance early in the season, though some cotton bolls may be shed as a result of its punctures. As its numbers increase, the number of rotted bolls becomes greater until the first bolls begin to open, when *Dysdercus sidae*, Montr., comes into the fields. Some of the *Tectocoris* bugs are attracted to the seeds in the opening bolls and *D. sidae* attacks the green bolls of the developing top crop, so that by the time atmospheric conditions are suitable for the production of boll-rots the top crop is so badly stained and the lint so weakened that it is nearly worthless. In the field the damage done by *T. lineola* is nearly always complicated by fungus attacks, the chief species concerned being *Fusarium moniliforme*, and up to 50 per cent. of infection by this species being due to *T. lineola* [*R.A.E.*, A, xiii, 521].

The attacked bolls may be distinguished externally by a small plug of tissue protruding from the wound and internally by the proliferation of the boll-wall forming a callus of excrescence, the interior of which contains a brown stain marking the tract of the stylets.

The first adults were noticed in the field on the 19th October, and the first eggs were found on the 11th November ; they were presumably laid on the 6th of November, and they hatched on the 24th. This meant that by the time the nymphs were in the second instar there would be half-grown green bolls for them to feed on (21–28 days). It is safe to assume that infestation will begin in the fields about a week before flowering. The females often remain near their eggs, protecting them until they are hatched. Eggs thus guarded are apparently protected from predacious enemies ; parasites have been noticed trying to dodge the female. The eggs are laid round a twig or leaf-petiole, generally on one with an upward slope, some were laid on dry twigs on the standover cotton. The incubation period varies from just over 16 days to 22 days. The females develop into adults slightly more slowly than the males ; the nymphal life varies from 70 to 77 days.

The natural enemies of this pest are birds, spiders, an ant, a Blattid and the egg parasites, *Telenomus oecleus*, Dodd, *Pachycrepis tectacorisi*, Gir., *Eupelmus redini*, Gir., and *Ericydnus hemipterus*, Gir. The percentage of parasitism from the middle of November 1924 to the end of April 1925 varied from 91 to 0·3, the highest figure being reached in December. Heat apparently has an adverse effect on the parasites.

Handpicking is effective and is the only known means of control.

HARGREAVES (H.). **Notes on the Coffee Berry-borer** (*Stephanoderes hampei*, **Ferr.**) **in Uganda.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 347–354, 3 figs. London, March 1926.

Stephanoderes hampei, Ferr., is of major importance to coffee-growers in Uganda, where the damage caused by it over a series of years must nearly equal that done by *Antestia lineaticollis*, Stâl. During severe infestations as many as 80 per cent. of the coffee berries on a particular estate may be attacked. The damage is greatest to coffee grown under shade; probably this is due rather to the preference of the parasites for sunny areas than to any preference of the borers for shade. The injury is the direct result of the feeding of the larvae and the adults on the coffee bean; the whole bean may be destroyed or so extensively damaged as to render it valueless. The female enters the berry almost invariably in or near the small depression at the tip, making a clean-cut, circular hole. The eggs are laid in a tunnel within the bean; they hatch in 8–9 days, and the larvae feed on the tissues of the bean, producing a small gallery off the main tunnel of the adult. The female larvae feed for about 19 days, the males for 15, and the pupal stage lasts 7–8 days. The maximum number of eggs laid by one female was 63, with an average of 31. In captivity the females live for 5–16 weeks, though the males only live for 10–56 days. There is apparently no relation between prevalence of the beetle and particular weather conditions; food is available throughout the year, and breeding is apparently continuous. There are at least 8 broods a year, the generations overlapping and all stages being present at any time. Coffee is apparently the only food-plant, both *Coffea arabica* and *C. robusta* being attacked.

The bulk of the information concerning the parasites has already been noticed; they are an unidentified Hymenopteron [*R.A.E.*, A, xi, 32], *Prorops nasuta*, Watrst. [*R.A.E.*, A, xii, 469] and *Heterospilus coffeicola*, Schmied. [*R.A.E.*, A, xii, 470]; the last-named appears to be the most important.

No satisfactory artificial remedial measure has so far been discovered. Owing to the cost of materials and appliances and the unsuitable type of labour, spraying cannot be adopted in Uganda, and fumigation with hydrocyanic gas is also too costly. A method which is applicable under certain circumstances consists of picking and destroying by burial or other means the smaller crop, maturing in April. The expense of the labour and loss of crop is only warranted in cases where severe infestation and absence of parasites is likely to render the retention of this crop a grave danger to the succeeding larger one.

At the Government Plantation, Kampala, conditions are apparently unfavourable to severe infestation. The only unusual factor in evidence is the growing of *Coffea robusta* on plots in close proximity to plots of *C. arabica*. This seems to indicate that *C. robusta*, which carries a certain amount of maturing berries throughout the year, has a decidedly beneficial influence on the parasites of *S. hampei*. The harvesting of ripe berries involves the elimination of a greater percentage of parasites than of beetles and thus tends to increase the infestation. The beetles usually survive pulping of the coffee, and escape from the beans while they are drying in the trays, whereas the immature stages of both the beetle and its parasites probably die during the exposure of the beans to the sun. Moreover, when the whole of a crop of *C. arabica* has been picked, little of the next crop has reached the stage in which appreciable numbers of the parasites can find suitable host material. Borer infestation is negligible on estates that have been abandoned for some time, and on which the crops have not been picked. In this connection experiments are being made in which *C. robusta* is being grown amongst *C. arabica*, the berries of the former being allowed to dry and fall naturally. It will be several years before any reliable conclusions can be drawn from the experiment.

China (W. E.). **A new Species of *Triphleps* (Heteroptera, Anthocoridae) preying on the Eggs of *Heliothis obsoleta*, H.S., in Queensland.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 361–362, 1 fig. London, March 1926.

Triphleps australis, sp. n., predacious on the eggs of *Heliothis obsoleta*, F., in Queensland, is the first species of this genus to be recorded from Australia.

Pospelov (V. P.). **The Influence of Temperature on the Maturation and General Health of *Locusta migratoria*, L.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 363–367, 3 pls., 13 refs. London, March 1926.

Experiments in cages with controlled temperature showed that individuals of *Locusta migratoria* kept at a temperature fluctuating between 68° and 86° F. from the time of the third instar did not attain full sexual maturity and died, while at 95°–100° F. they matured within about a month after the final moult. An examination of adult locusts before and after migration shows that the latter acts as a stimulus to the development of the genital cells, probably owing to the rise of body temperature during flight. Microscopical examination reveals a connection between the maturation of the sexual cells and physiological processes in the fat body ; the retardation of maturation is not, however, due to accumulation of urates, which are the cause of a diapause in the pupae of Diptera according to Roubaud [*R.A.E.*, B, xi, 55]. In locusts some part is played in this process by *Coccobacillus acridiorum*, which is a normal symbiont in their blood, but is able to become a dangerous parasite under certain conditions, notably a low temperature.

Cowland (J. W.). **Notes on the Sweet Potato Pyralid Moth, *Megastes grandalis*, Guen.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 369-372, 2 figs. London, March 1926.

Megastes grandalis, Guen., is distributed throughout Trinidad, and during certain seasons is a very serious pest of sweet potatoes (*Ipomoea batatas*), the only food-plant known at present. The early stages are described.

The larvae tunnel through the underground parts of the plant, leaving only the cortex untouched ; there is consequent stunting of growth, shedding of leaves, and lack of tuber production. If tubers are formed, they are often riddled by the larvae, which penetrate to them through the roots. The eggs are firmly fixed in the axils of the leaf-petioles or on either side of the basal veins on the lower surface of the leaf. They may be laid singly or several in a row, but never in clusters. In captivity the number laid by one female varied from 130 to 180 over a period of 2–3 days. In March and April they hatch in a week. The larva begins feeding at once near the spot where the egg was laid. In the field it soon travels to a position just above the surface of the ground, where it finally enters the stem and bores down the root. The larval stage lasts 5–7 weeks. The cocoon is spun near the opening above ground, from which the moths emerge 17–21 days later, the actual pupal stage lasting 13–16 days.

Trichogramma minutum, Riley, was reared from the eggs, and *Sarcophaga sternodonta*, Towns., from the full-grown larvae. Another

Tachinid, *Masicera ? abdominalis*, Wulp, and according to Urich, the Ichneumonid, *Xyphosoma azteca*, Cress., are also parasites of *M. grandalis*.

GAHAN (A. B.). U.S. Bur. Ent., & WATERSTON (J.). **Notes on Encyrtidae (Hym.-Chalcidoidea) bred from Psyllids, with Description of a New Species.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 373–375, 1 fig. London, March 1926.

Psyllaephagus arbuticola, sp. n., reared from *Euphyllura arbuti*, Schwarz, is described from California. *P. euphyllurae*, Silv., is recorded as a parasite of *E. olivina*, Costa, attacking the olive (*Olea europaea*) in Italy, Sicily and Portugal.

PROUT (L. B.). **A New Geometrid Moth Attacking Deodars in India.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 377–378. London, March 1926.

The Geometrid responsible for the extensive damage to deodars in India [*R.A.E.*, A, xiv, 37] is described as *Ectropis deodarae*, sp. n.

KEMNER (N. A.). **Some Termites from Ceylon.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 379–392, 5 figs. London, March 1926.

The species dealt with include *Calotermes militaris* ab. *unidentatus*, n., from branches, stems and roots of tea; *Odontotermes horni* var. *hutsoni*, n., from coconut logs, dead and living tea bushes, and roots of cacao; *O. horni* var. *minor*, n., on dead wood of living tea and dead bark of *Hevea*; *Eutermes ceyloniellus*, sp. n., from stems and roots of tea; and *Capritermes hutsoni*, sp. n., from roots of tea.

FEDOROV (S. M.). *Theresia ampelophaga*, **Bayle, in Crimean Vineyards.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 393–397, 2 pls., 1 ref. London, March 1926.

The Zygaenid, *Theresia* (*Procris*) *ampelophaga*, Bayle, only occurs in the southern coastal districts in the Crimea, where it mainly inhabits the valleys.

There is only one generation a year, the winter being passed in the larval stage and not in the egg stage as in south-eastern France where there is also only one generation, or in the pupal stage as in Italy where there are two generations. The normal life-history (allowing for the protracted stages as mentioned above) appears to be the same everywhere, *i.e.*, 10–12 days for the egg stage, 23–28 days for the larval stage and 10–15 days for the pupal stage.

At the beginning of August the larvae of the third and fourth stage begin to look for suitable hibernating quarters, which may be in the cracks of bark of old vines, though in the majority of cases they burrow into the centre of the vine stems cut the year before. They emerge from hibernation at the end of March or early in April. Towards the end of May or beginning of June they prepare for pupation, which may occur on old vines under the bark, on other trees, or under stones, fallen leaves, etc. Pupation does not occur until 6–7 days after the cocoon is made, the moths appearing in nature from the 20th of June to about the 10th of July. They only live about a week, do not feed, and have never been observed on flowers. The eggs are laid in clusters on the lower surface of the leaves, very rarely on the upper surface, and then only in well shaded places. They have also been found on certain weeds, such as *Psarolea bituminosa*, in which case the larvae upon hatching immediately drop by silk threads to vines, which are the only food-plant.

In the early spring they damage the vines by making small holes into the buds and excavating them from inside, thus destroying the fruit-bearing shoot; later the leaves are skeletonised. From 10 to 12 larvae are sufficient to deform one plant completely, even 3 or 4 reduce its productivity by 40–50 per cent.

In some localities *T. ampelophaga* occurs in large numbers on wild vines (*Vitis vinifera*) and is entirely absent from the vineyards. Of the cultivated varieties muscatels are most preferred, and the moth is most abundant in vineyards with many old vines and dead stumps that provide places for pupation and hibernation.

In the autumn and winter, when the larvae are hibernating, the remaining parts of the cut shoots should be cut down to the first knot and burnt with the loose bark, which should be removed from old vines. The fences in vineyards should never be made of old vines or other material in which the larvae might hibernate. Regular digging over of the soil produces vigorous growth of the plants, and prevents the emergence of the moths from any of the pupae in the soil.

Spraying should be done when the buds are filling up in spring (March or early April in the Crimea), again when the leaves are fully opened (later in April), and if necessary again in July and August. Paris green may be used or barium chloride (3 per cent. solution), the addition of molasses to the latter at the rate of 1 lb. to 16 gallons increasing the adhesiveness of the spray.

RUSCHMANN (W.). **Ein neuer Bananenschädling auf den Kanarischen Inseln und seine Bekämpfung.** [A new Pest of Bananas in the Canary Islands and its Control.]—*Der Tropenpflanzer*, xxix, no. 3, pp. 97–100. Berlin, March 1926.

The larvae of the Lyonetiid moth, *Hieroxestis subcervinella*, Wlk., attack bananas in the Canary Islands, feeding in the bunches, both in the stems and fruits. The damage in 1924 was so serious that in some plantations one-third of the bunches were unfit for shipment. The moth is apparently a native of Mauritius, whence it has been carried to St. Helena, the Canary Islands and Madeira. Such transport is likely to happen, as the larva is a feeder on such rubbish as sugar-cane débris. The adults are rarely seen by day. They oviposit on wet, rotting, parts of plants. The larvae pupate in a case made with their excreta.

In an attempt to combat this moth all rotting débris was made into heaps and covered with lime. As the moths oviposit on cut surfaces, these were covered with lime 10 days after the stems had been cut down with a view to destroying the eggs laid there in the interval.

BRYANT (G. E.). **New Species of Phytophaga (Col.).**—*Ann. Mag. Nat. Hist.*, xvii, no. 100, pp. 403–410, 7 figs. London, April 1926.

The species described include the Halticid, *Chaetocnema zeae*, sp. n., taken on maize and grass in Sierra Leone.

D[UPONT] (P. R.). **L'invasion des pucerons jaunes dans les plantations de cocotiers à Mahé.**—*Seychelles: Bull. Dépt. Agric. & Pêche*, no. 6, pp. 4–6. Victoria, Seychelles, February 1926.

The Coccids mainly responsible for considerable damage to coconuts in certain parts of the Seychelles are *Pinnaspis buxi*, *Chrysomphalus aonidum* (*Aspidiotus ficus*), *A. ansei* and *Ischnaspis longirostris* (*filiformis*). Others of minor importance are *Aspidiotus lataniae*, *C.* (*A.*) *dictyospermi*, and *Pseudaonidia* (*A.*) *trilobitiformis*. Though the latter were just as destructive in the past as the former, they have gradually been reduced to the status of minor pests by unknown causes.

KIRBY (A. H.). **Control of Plant Pests and Diseases.**—*Tanganyika Terr. Rept. Dept. Agric. 1924–25*, pp. 20–21. Dar-es-Salaam [1925]. [Recd. March 1926.]

The areas in which *Platyedra gossypiella*, Saund. (pink boll worm) is likely to do serious damage in Tanganyika Territory have now been definitely ascertained. Under the German administration it was thought to be indigenous, but the apparent freedom from it of neighbouring countries such as Uganda and Nyasaland, the fact that it is confined to districts along lines of communication, and its apparent absence from Mwanza and Shinyanga, where nothing but Uganda seed was imported by the Germans, indicate that this is not the case, and that it was probably introduced from India through Egypt.

During 1924 the numbers of *P. gossypiella* increased noticeably, though every effort was made to enforce the observance of uprooting and burning measures. The local quarantines recommended for the maintenance of uninfested areas are reviewed.

[RITCHIE (A. H.).] **Entomological Report, 1924-25.**—*Tanganyika Terr. Rept. Dept. Agric. 1924–25*, pp. 41–44. Dar-es-Salaam [1925]. [Recd. March 1926.]

Scyphophorus acupunctatus, Gyl. (sisal weevil) was prevalent at Tanga. *Rhynchophorus ferrugineus*, F., is rarely found on coconuts, its principal breeding-grounds being the native palms, *Borassus flabellifer*, *Phoenix reclinata* and *Hyphaene coriacea*.

Stephanoderes hampei, Ferr. (coffee-bean borer) has not been found on *Coffea arabica*, being apparently confined to *C. robusta*, which is grown in Bukoba. The Bostrychid, *Apate monacha*, F., is rare, and it may easily be controlled by injecting chloroform or carbon bisulphide into its mines. *Thliptoceras octoguttalis*, Fld. (coffee-berry moth) may be controlled by lead arsenate sprays applied between and behind the berries. A combined spray of lead arsenate and Bordeaux is recommended. Cultural measures to stimulate the bushes to rapid and abundant leaf-growth are recommended for the control of *Leucoptera coffeella*, Staint. In 1923 experiments for the control of *Antestia lineaticollis*, Stål (coffee bug) were begun with a poison spray consisting of $\frac{1}{10}$ lb. sodium arsenite, 10 lb. native sugar and 100 gals. water. It is lightly flicked over the plant, not applied as a drenching spray. New growth may show scorching, but there is no injury to berries or mature foliage. The results are promising.

Anatrachyntis sp., appeared in scattered areas on cotton in late October and November. The larvae live in locules of bolls previously destroyed by *Platyedra* and are considered to be only scavengers. *Gracilaria* sp. appears annually, being most abundant in May; it is of no importance as a cotton pest at present. The cleaning up of stems and residues in cotton plantations at the end of 1922 and 1923 proved effective against *Apion xanthostylum*, Wagn. (cotton weevil). *Tragiscoschema nigroscripta*, Fairm., is responsible for most of the stem girdling of cotton, which had been previously attributed to *Alcides brevirostris*, Boh. *Heliothis obsoleta*, F. (American bollworm) appeared on the first foliage of cotton planted with the early rains in January. In March and April larvae were taken on maize planted in January, so that the heavy infestation of the first cotton bolls of mid-May to mid-June would appear to be dependent on the incidence of the pest on such maize and on the extent of its cultivation in the vicinity of cotton. The aestivating individuals of the May-June brood carry this moth over to the small-rain period and the foothill maize crop. After the disappearance of this brood, cotton bolls are not further attacked, and cotton planted in suitable weather and soil conditions usually recovers from the previous attack. This moth is also recorded on *Cajanus indicus*. Other pests of cotton are *Prodenia litura*, F., which does not occur in destructive numbers; *Earias insulana*, Boisd., and *E. biplaga*, Wlk. (*citrina*, Saalm.), occurring sparingly throughout the cotton areas; and *Aphis gossypii*, Glov., generally present, but kept in check by natural enemies, including the Coccinellids, *Alesia striata*, F., *Chilocorus wahlbergi*, Muls., *Cydonia posticalis*, Fairm., *C. lunata*, F., *C. quadrilineata*, Muls., *Platynaspis capicola*, Crotch, *P. kollari*, Muls., and *Scymnus trepidulus*, Wse.

The larvae of the following Lepidoptera are added to the list of the cotton leaf-feeders that appeared in the report for 1922 [*R.A.E.* A, xi, 531]; *Parasa vivida*, Wlk., *Taragama carinata*, Wllgrn., *Xanthodes graellsi*, Feisth., *Cosmophila* (*Anomis*) *flava*, F., and *Arctornis* (?) *rubricosta*, Fawcett.

Experiments during 1924 have shown that the exclusion of insects from flowers and bolls ensures normal healthy development of the boll wall and its contents even under conditions considered highly conducive to the propagation of disease and at a season when the incidence of boll disease in the main crop is unduly high. The cotton-stainers, *Dysdercus nigrofasciatus*, St., *D. fasciatus*, Sign., and *D. cardinalis*, Gerst., are generally present throughout the cotton-growing districts. Other Rhynchota that have been recorded on cotton are *Odontopus confusus*, Dist., *Antilochus nigrocruciatus*, St., *Agonoscelis versicolor*, F., *Callidea bohemani*, St., *Lygaeus pandurus*, Scop., *L. furcatus*, F., *Nezara viridula*, L., *N. chloris*, Westw., *N. chlorocephala*, Westw., *N. millierei*, Muls. & Rey, *Leptoglossus membranaceus*, F., *Atelocera stictica*, Westw., *Bagrada hilaris*, Burm., *Halyomorpha viridescens*, Wlk., *Aspilocoryphus fasciativentris*, St., and *Steganocerus multipunctatus*, Thnbg.

Cotton-stainers are most abundant when the main crop of kapok [*Eriodendron anfractuosum*] is maturing in late November and December, a time when the cotton crop has been completely picked. The situation with regard to *Platyedra gossypiella*, Saund. (pink boll worm) is not so satisfactory as might be expected, chiefly as a result of complete disregard of instructions by the natives respecting picking and uprooting the plants at the appropriate times.

KAIFE (S. H.). **The Locust Fungus,** *Empusa grylli,* **and its Effects on its Host.**—*S. Afr. Jl. Sci.*, xxii, pp. 298–308, 1 pl., 14 refs. Johannesburg, November 1925. [Recd. March 1926.]

This is a detailed account of observations on *Empusa grylli*, chiefly n South-West Africa, most of which have already been noticed from nother source [*R.A.E.*, A, xiii, 527]. During these investigations, ocusts were also found to be infected with a species of *Isaria*, which pparently caused death in a small percentage of cases. A species of *osema* was found in the alimentary canal of a few locusts, and an nnamed Gregarine was often found in the intestine, but this does not pparently cause its host much inconvenience.

epartmental Activities: Entomology.—*Jl. Dept. Agric. Union. S. Africa*, xii, no. 3, pp. 195–201. Pretoria, March 1926.

The growing of peppermint on a commercial scale for production of he essential oil is an industry that might well be extended in South frica. In one locality the roots are infested by an unknown mealybug, vhich appears in large numbers in November and December and by anuary is generally deeper in the soil on the rootlets. A small fly hat is predatory in its larval stage on the mealybug has been reared rom infested roots and may prove to be an adequate control for it. s South Africa is making every effort to keep the pink bollworm *Platyedra gossypiella*, Saund.] out of the country, importers are dvised to caution their oversea suppliers against sending any sort f produce in old cotton or cotton-seed bags. The relative attractiveess of various species of *Eucalyptus* to the eucalyptus snout beetle *Gonipterus scutellatus*, Gyll.] is again discussed [*R.A.E.*, A, xiii, 38; iv, 200], and it is now stated that *E. rostrata* also is attacked. usting calcium arsenate over infested trees by aeroplane has been ried with good results, but would scarcely be profitable. *Cydia* *Carpocapsa*) *pomonella*, L. (codling moth) has recently been found nfesting loquats [*Eriobotrya japonica*]; the larvae burrow into the eeds when the pulp of the fruit dries, almost entirely devouring them. Larvae of *Myelois ceratoniae*, Zell., have been found in ripening navel ranges, the infestation apparently always beginning at a split in the ind. *Aphelinus mali*, Hald., has been found abundantly attacking he woolly apple aphis [*Eriosoma lanigerum*, Hausm.] in the Orange Free State; this is remarkable as apparently this parasite has never een introduced into this region. *Heliothis* (*Chloridea*) *obsoleta*, F., *Brithys pancratii*, Cyr., and *Phytometra* sp. were found in numbers n injured almond blossoms, and were sucking the nectar, but none f the common fruit-piercing moths were observed. Adults of *rgyroploce leucotreta*, Meyr. (false codling moth) have been found by xperiment to feed on sweetened poison bait and to succumb to its ffects. The distortion of young *Citrus* foliage in the Transvaal by he Psyllid, *Trioza merwei*, Pettey, is very common, but whether the rop will be affected is not known.

Young pine trees have been partly or wholly defoliated by larvae of *udaurelia cytherea*, F., many of which were infested by a Hymenoperous parasite and some by a Tachinid; many were captured by haking the trees and then killed, and 80 per cent. of the pupae were estroyed by turning over the soil and exposing them. *Nysius* *inotatus*, Germ., has been very numerous on potatoes and other egetables, garden flowers and fruit, particularly peaches.

Attention is called to the fact that *Platyedra gossypiella* has been found in the northern extremity of the Nyasaland Protectorate drastic control measures are being undertaken ; cotton culture is to cease in the infested territory and in the belt of 150 miles of non-cotton country that lies between it and southern districts.

Gunn (D.). **The Carnation Worm.**—*Jl. Dept. Agric. Union S. Africa* xii, no. 3, pp. 225–227, 2 figs. Pretoria, March 1926.

Carnations in the Transvaal have been suffering for some time past from the attacks of a Tortricid moth, *Epichorista ionephela*, Meyr In the Cape, the eggs are laid in numbers on both surfaces of the leaves the incubation period lasting from 9 to 12 days. The young larva immediately begins to feed on the upper surface of the leaf, but soon burrows into a shoot or occasionally into the node of a stem ; it also binds together several leaves as a protection from heat and enemies In bad infestations so many shoots and buds may be injured that no flowers form. The larval stage varies according to climatic conditions from 24 to over 40 days. The mature larva spins a cocoon either at the top of its burrow or between the leaves it has bound together Control measures should be undertaken in early September, when the pest becomes active. Plants were sprayed once each week with a spray consisting of 1¼ lb. lead arsenate powder to 40 gals. of water or one of 1 gal. tobacco extract containing from 6 to 8 per cent. nicotine to 60 gals. of water, with 1 lb. good yellow soap to each 20 gals. of spray Both must be applied as a fine mist, and after their use for 4 months the pest was reduced to negligible proportions. Further measures such as dusting with Paris green and lime, may be devised.

Ministry of Agriculture, Egypt. **Report on the Work of the Entomological Section from its Commencement in August 1911 to March 1923.**—8vo, v+107 pp., 1 pl. Cairo, Govt. Pubns. Office, 1926. Price *P.T.* 10.

This historical review of the work of the Entomological Section of the Ministry of Agriculture, Egypt, is divided into six parts, the first of which covers the period from 1911 to March 1918, while the remainder are annual reports. The first five parts are by Dr. L. H. Gough, and the sixth by C. B. Williams ; the reports contain a considerable amount of detailed information on the investigations of the Section and include summaries of the legislation dealing with insect control in force during the period covered.

Kinch (E. A.). **Locusts in Iraq.**—*Internat. Rev. Sci. & Pract. Agric.*, N.S. iii, no. 4, pp. 1182–1189. Rome, October-December 1925. [Recd. March 1926.]

Locusts are one of the principal obstacles to agricultural development in Iraq. The two chief checks to them in Upper Iraq are birds, which destroy great numbers in the moulting stages, and cold weather, which prevents hatching of the eggs. The money allotted for locust work should be spent on the collection of eggs, this method giving better results than any other. Ploughing is useful provided that the eggs thus turned up are collected. At present, attempts are made to control the locusts after they have hatched, but the author considers that this is uneconomical and that it would continue to be so even if more funds were available owing to the smallness of the population. No more money should be spent on locusts unless a proper organisation is formed which would be in existence permanently. Unless a comprehensive scheme, continued over a number of years, can be sanctioned, the problem is best left entirely alone.

GARDNER (J. C. M.). **Descriptions of New Species of Niponiidae and Cerambycidae from India.**—*Indian Forest Records*, xii, pt. 7, pp. 193–209, 1 pl., 1 fig. Calcutta, 1926.

In this paper four new species of *Niponius* and twelve new Cerambycids are described from India. Some species of *Niponius* are known to be predacious on Scolytids, and those here described were all found in association with bark-beetles.

MACKIE (F. P.). **Boll Weevil in Cotton.**—*Rept. Bombay Bact. Lab. 1924*, pp. 30–31. Bombay, 1925. [Recd. March 1926.]

Tests have been made with hydrocyanic acid gas with a view to fumigating American cotton to prevent the introduction of the boll weevil [*Anthonomus grandis*, Boh.] into India. In the absence of this species various native weevils were used in these tests including *Calandra*, which proved the most resistant. The time of exposure appeared to be of greater importance than the concentration of the gas; thus all individuals of this weevil were killed after exposures for 19 hours or more to a concentration evolved from ½ oz. each of sodium cyanide and sulphuric acid, whereas concentrations obtained with 1 oz. had no effect even after 6 hours.

With formaldehyde vapour all the weevils were killed in 4 hours by a concentration of 10 parts per 100,000 or in 2 hours by 20 parts per 100,000.

A few experiments to test the absorption of hydrocyanic acid by various substances indicate that liquid paraffin does not absorb the gas but that cotton and kerosene do.

RAMAKRISHNA AIYAR (T. V.). **An Annotated List of the Thysanoptera known from India and Ceylon.**—*Jl. Bombay Nat. Hist. Soc.*, xxx, no. 4, pp. 861–871, 18 refs. Madras, 15th December 1925. [Recd. March 1926.]

In this paper an attempt is made to catalogue the known Thysanoptera of India and Ceylon as a working reference list, and all records up to 1924 have been included so far as possible. The arrangement of the list is more or less based on the synoptical tables of Dr. Karny, and a key is given to the subdivisions and families. A list of the new Indian forms, to be described in a forthcoming paper by Dr. Karny, is appended.

DE ALWIS (E.). **The Small Tussock Moth** (*Notolophus posticus*, **Wlk.**), **a Pest on Dadap** (*Erythrina lithosperma*, **Bl.**).—*Yrbk. Dept. Agric. Ceylon 1926*, pp. 19–21, 1 pl., 5 refs. Peradeniya, 1926.

A brief description is given of the various stages of *Notolophus posticus*, Wlk. It is spreading in Ceylon and will probably soon have to be recognised as one of the pests of dadap. A list of the recorded food-plants is given, those on which the larvae fed in the insectary during the present observations are tea, dadap (*Erythrina lithosperma*), castor (*Ricinus communis*) and cacao (*Theobroma cacao*). In Ceylon this moth is mostly confined to the hilly districts. The larvae feed on the leaves, preferably the tender ones, until only the veins are left. Pupation occurs in a cocoon spun between leaves or on twigs, and the female moth lays her eggs on the cocoon from which she has emerged. The whole life-cycle occupies from 33 to 46 days, the egg stage 7–11 days, the larval 16–20, the pupal 7–9, and the adult 3–6 days. The larvae are parasitised by the Tachinid, *Tricholyga sorbillans*, Wied. The collection and destruction of all the stages is the best remedial measure, but in serious outbreaks spraying with 2 oz. of lead chromate to 3 gals. water may have to be resorted to.

Hutson (J. C.). **The Spotted Locust, *Aularches miliaris* L.**— *Yrbk. Dept. Agric. Ceylon 1926*, pp. 36–44, 1 pl., 3 refs. Peradeniya, 1926.

In view of outbreaks of *Aularches miliaris*, L., in Ceylon during 1925, it has been thought advisable to summarise the existing knowledge concerning this pest. Its distribution in general and particularly in Ceylon is discussed, and the various stages are described. During the first few weeks of adult life, both sexes are very active and feed voraciously. At this time they may fly to the tops of tall trees such as dadap (*Erythrina lithosperma*), jak (*Artocarpus integrifolia*) or coconut palms, which are rapidly defoliated. The oviposition is described ; the eggs are laid in the ground and hatch in about 4 months under laboratory conditions. The nymphal stage lasts about 4½–5½ months, and the adult stage about the same, making a total life-cycle of 13–15 months.

According to Green, dadap is the favourite food-plant, failing this the locusts will attack coconut, areca nut (*Areca catechu*), jak and plantain (*Musa*), but have not been observed to do any direct harm to tea, cacao or rubber.

The young hoppers may be collected in March and April when they emerge and cluster on low-growing plants. The winged adults when on low-growing dadap trees may be controlled by lopping these trees so that the locusts congregate on the unlopped portions, where they may be collected and destroyed. They can also be destroyed when they are massed on the breeding-grounds, which should be marked and the soil dug over thoroughly so as to expose the eggs to weather conditions and natural enemies.

Peries (F. D.). **Notes on the Life History and Habits of the Curry-leaf Beetle, *Silana farinosa*, Boh.**— *Yrbk. Dept. Agric. Ceylon 1926*, pp. 51–54, 1 pl. Peradeniya, 1926.

Silana farinosa, Boh., was found doing considerable damage to the leaves of the curry-leaf tree (*Murraya koenigii*) during July in Peradeniya. The larvae feed on the epidermis of the leaf, usually on the lower surface, removing the greater portion of the tissue. The adults also feed on the lower surface of the leaf, producing irregular holes or eating from the edges. The eggs are laid in clusters in an egg-case composed of dried viscid material excreted by the beetle, on the lower surface of the tender leaves. Under insectary conditions the incubation period lasted 6–10 days with an average of 7, and the larval stage 17–26. When ready to pupate, the larva fastens itself to the upper surface of the leaf, the pupal stage lasting 5–6 days.

If the trees are not more than 6 feet high, all the stages may be hand-picked ; in taller trees the infested branches should be carefully pruned and the prunings burnt. In severe infestations it may be necessary to spray with a non-arsenical insecticide such as lead chromate.

v. d. Meer Mohr (J. C.). **De aardappelknollenrups** (*Phthorimaea operculella*) **en de tabakscultuur in Deli.** [The Potato Tuber Moth and Tobacco Cultivation in Deli.]—*Deli Proefst.*, Vlugschr. 34, 4 pp., 1 pl. Medan, January 1926.

The potato tuber moth, *Phthorimaea operculella*, occurs in Java where its life-history has been recorded [*R.A.E.*, A, xii, 551 ; xiii, 290]. In Java it has begun to attack tobacco, serious injury resulting in some districts in 1925. *Datura stramonium* is the third food-plant noticed in the field, while in the laboratory at Buitenzorg it fed on *Solanum torvum*, *S. nigrum*, *Physalis angulata* and *Datura suaveolens*. Up to the present *P. operculella* has not been found in Deli (Sumatra). *S. torvum* and *P. angulata* are common plants in the tobacco districts of Deli.

Shiraki (T.). **On Migratory Locusts.** [*In Japanese.*]—*Formosan Agric. Rev.*, xix, no. 3, pp. 219–248 ; no. 4, pp. 332–344 ; no. 6, pp. 521–523 ; no. 7, pp. 619–629 ; no. 8, pp. 689–694 ; no. 11, pp. 966–969 ; xx, no. 1 pp. 47–58. Taihoku, Formosa, March 1925–January 1926.

This is a popular account of the migratory locusts, with special notes on *Locusta* (*Pachytylus*) *migratoria* ph. *migratorioides*, Reich., migrations of which into Formosa from the Philippines took place in 1896, 1905, 1914 and 1923. The locust appears to have entirely died out in 1 or 2 years after each migration, and is normally absent from the island. One female that had migrated into Kashete Island, near Formosa, in 1923, laid at least 2 egg-masses, each containing on an average 35 eggs. These hatched in about 7 days, and the locusts reached the adult stage in something over a month, during which period 5 moults took place. In Formosa this locust appears to have 3 generations a year on the occasions when it occurs there.

Sonan (J.) & Fukuda (K.). **Notes on the Life-histories of some Formosan Acrididae.** [*In Japanese.*]—*Trans. Nat. Hist. Soc. Formosa*, xvi, no. 82, pp. 5–22. Taihoku, Formosa, February 1926.

Oxya vicina, F. [?Brunn], appears to have two generations annually near Taihoku, where the adults occur throughout the year. The nymphs reach the adult stage in about 2 or 3 months, during which period the males moult 6 times, and the females 6, 7, or sometimes 8. One egg-mass contains 24–44 eggs, with an average of 34. The females have a small pair of tonal organs on the lower side of the first abdominal segment ; these organs are lacking in the males, as well as in other species of *Oxya*.

Gastrimargus transversus, Thunb., appears to have two generations a year, and hibernation takes place in the egg stage, though some individuals winter in the nymphal stage. This stage normally lasts about 54–102 days, during which period 6 moults take place.

In *Tryxalis turrita*, L., there seems to be one generation a year.

KIKUCHI (K.). **On *Podops lurida* Burm. (Pentatomidae) in the Niigata Prefecture.** [*In Japanese.*]—*Jl. Plant Protect.*, xiii, no. 2, pp. 91–101. Tokyo, February 1926.

Podops lurida, Burm., causes great damage to rice in the Niigata Prefecture. There is one generation a year, and the adults that have hibernated begin to feed in June. Mating takes place from the middle of June to the beginning of August. The eggs are deposited, mostly in the evening, on rice or other graminaceous plants. One female can lay about 30 in 1–5 groups during life ; and the larvae hatch in about 4 days. Five moults occur, and the adult stage is reached in 47 days on an average. The adults crawl down the plants when disturbed and secrete a poisonous fluid that causes blindness in man. Two Hymenoptera are parasitic on the eggs of this Pentatomid, one of which kills 20 per cent. of them.

UCHIIKE (T.). **Studies on *Eriocampoides limacina* (Tenthredinidae) injurious to Fruit Trees.** [*In Japanese.*]—*Insect World*, xxx, no. 2, pp. 38–47. Gifu, Japan, February 1926.

In Japan the larval stage of *Caliroa* (*Eriocampoides*) *limacina* lasts 13–21 days according to the temperature, during which period 6 moults usually take place, though there are sometimes 4, 5 or 7. The mature larvae drop to the ground, where they pupate, the adults emerging 19–22 days later. The most favoured food-plants are various species of *Prunus* and *Pyrus*, *Cydonia vulgaris* (quince), *Rosa multiflora*, *Diospyros kaki* and *Ulmus campestris*.

YAMAMASU (Y.). **Results of some Experiments on the Poisonous Hairs in *Porthesia similis* (Lymantriidae).** [*In Japanese.*]—*Insect World*, xxx, no. 2, pp. 53–56. Gifu, Japan, February 1926.

The larvae of *Arctornis chrysorrhoea* (*Porthesia similis*) are furnished with poisonous hairs except in the first instar. The silkworm [*Bombyx mori*] is injured by these hairs chemically or physically when it eats mulberry leaves covered with them or comes into contact with them. The poison in the hairs can be counteracted or reduced by being kept at a temperature of 150 °C. [302° F.] for 7 hours.

GURNEY (W. B.). **Distribution of the Parasite *Aphelinus mali*.**—*Agric. Gaz. N.S.W.*, xxxvii, pt. 2, p. 162. Sydney, 1st February 1926.

Approximately 16,000 living individuals of *Aphelinus mali*, Hald., parasitic on the woolly aphis [*Eriosoma lanigerum*, Hausm.] have been distributed in New South Wales with full instructions on the methods of establishing and spreading them.

THOMAS (P. H.). **Black Cherry Aphis.**—*Fruit World of Australasia,* xxvii, no. 2, pp. 90, 92. Melbourne, February 1926.

In recent years *Myzus cerasi,* F. (black cherry aphis) has become a serious pest of cherries in Tasmania [*R.A.E.*, A, xii, 19], causing almost total defoliation and loss of crops and perhaps even killing the trees. The life-history is briefly outlined [*R.A.E.*, A, vi, 121; xiii, 421]. A heavily infested orchard of old trees was divided into four plots for experimental purposes; one plot was sprayed during the dormant period (August) with oil emulsion (1 gal. concentrate to 10 gals. water), and another at the same time with lime-sulphur (1 : 8); both these plots and one of the others were sprayed with nicotine sulphate (1 pt. concentrate and 2 lb. soft soap to 50 gals. water) after the petals had fallen (October 28th). By the time that the nicotine sulphate sprays were applied there were numerous colonies of Aphids on the young growths of the trees that were not sprayed in the dormant season, and the unsprayed control plot became heavily infested and was subsequently sprayed with strong nicotine sulphate solution to prevent the spread of the pest. The plot sprayed with oil emulsion, which had been the most heavily infested the previous year, was almost free from *M. cerasi*; the general appearance of the trees was much better, and the crops much heavier, than on the other plots. The lime-sulphur spray gave fair control, but a few colonies of Aphids appeared on the plot treated with it.

MILLER (D.). **The Bronze-beetle. Its Habits and Control as an Orchard Pest.**—*N.Z. Jl. Agric.*, xxxii, no. 1, pp. 9–14, 8 figs. Wellington, 20th January 1926.

The bronze beetle [*Eucolaspis brunnea,* F.] occurs in most parts of New Zealand, though it is not everywhere an important pest of orchards. The main injury is done to developing apples, pear, plum, peach, gooseberry, black-currant, raspberry and blackberry being also attacked. As a rule the adults feed on the foliage, making small shot-like holes, but the fruit may be scarred and deformed. Apples are generally attacked near the stalk, and there is a distinct difference in the susceptibility of different varieties, those growing in clusters being more favoured by the beetles, probably because of the shelter they afford. The larvae live in the ground and feed on plant roots, and the beetle may be greatly reduced by cultivation. Lead arsenate does not give satisfactory control. Dusting with Cyanogas calcium cyanide "A" dust [*R.A.E.*, A, xiv, 74] was tried, and although the trees were not covered by tents and the weather conditions were far from ideal on account of strong winds and intermittent showers, the results were very promising, 75 per cent. of the beetles being killed. The dust was mixed with an equal quantity of air-slaked lime and applied at the rate of 1 lb. per tree, the trees being 10 ft. high. To prevent the recovery of the stupefied beetles that fall from the tree, only 75 per cent. of the dust was applied to the trees themselves, the rest being placed on the ground beneath them. It was found best to blow the dust on to the apples.

This dust also proved promising as a general insecticide, killing almost 100 per cent. of apple leafhoppers and many Aphids.

Cleare, Jr. (L. D.). **Report of the Biological Division.**—*British Guiana : Rept. Dept. Sci. & Agric. 1924*, pp. 65–68. Georgetown, Demarara, 1926.

One of the most important events with regard to sugar-cane during the year was the importation of *Lixophaga* (*Euzenilliopsis*) *diatraeae*, Towns., for the control of the small moth borers [*Diatraea* spp.] [*R.A.E.*, A, xiii, 86]. A severe outbreak of *Remigia punctularis*, Hb. (*Mocis repanda*, auct.) (grass looper) occurred on sugar-cane throughout the colony in the middle of July, the leaves in some cases being completely stripped. This moth nearly always occurs in large numbers after a long period of dry weather. It may be controlled by spraying or dusting with lead or other arsenate. The second generation did little damage, apparently owing to the prevalence of natural enemies, including *Sarcophaga chrysostoma*, Wied. In connection with the mottled appearance of sugar-cane, suggesting infection with mosaic, a collection was made of Aphids occurring on grass and other food-plants and included *Carolinaia cyperi*, Ainslie, on nut-grass (*Cyperus rotundus*) ; *Aphis setariae*, Thos., on sugar-cane and Para grass (*Panicum barbinode*) ; *A. maidis*, Fitch, on *Sorghum*, maize and Para grass ; and *A. gossypii*, Glov., on cotton and *Ruellia tuberosa*.

There was no serious outbreak of coconut pests during the year, though *Tropidacris latreillei*, Perty, occurred in one locality.

Scolytid and other beetles boring in timber were *Platypus mulsanti*, Chap., *P. alternans*, Chap., *Xyleborus obruens*, Smp., *X. torquatus*, Eichh., *X. affinis*, Eichh., *X. intersetosus*, Bldf., *X. confusus*, Eichh., *X. fuscatus*, Eichh., and *Silvanus trivialis*, Grouv.

Moreira (C.). **Combatendo os insectos inimigos.** [Against Insect Pests.]—*Chacaras e Quintaes*, xxxiii, no. 2, pp. 126–127. S. Paulo, 15th February 1926.

The best measures against *Macrodactylus pumilo*, which defoliates pear trees in Brazil, are digging up the ground, and thus exposing the eggs and larvae to poultry, and capturing the adult beetles. Against the caterpillars of *Melittia satyriniformis* attacking melons, the fruits should be enveloped in bags of newspaper or in wrappings of straw.

Averna-Sacca (R.). **As manifestações pathologicas que acompanham o desenvolvimento da broca** *Stephanoderes hampei* **Ferr.** (=*St. coffeae*, **Hag.**) **nos fructos ou nas sementes do cafeeiro. Nota preliminar.** [The Pathological Phenomena accompanying the Development of *S. hampei* in the Berries or Beans of Coffee. Preliminary Note.]—*Comm. Estudo e Debellação da Praga Cafeeira*, Pub. 15, 87 pp., 41 figs. S. Paulo, 1926.

This is a report on the fungi noticed in coffee-berries and beans infested with *Stephanoderes hampei*, Ferr., the coffee borer. None of them appears to be pathogenic to the beetle.

Bondar (G.). **A broca nas raizes do algodoeiro.** [The Borer in the Roots of the Cotton Plant.]—*Correio-agric.*, iii, no. 9, pp. 241–248, 6 figs. Bahia, September 1925. [Recd. April 1926.]

The weevil, *Gasterocercodes gossypii*, Pierce, is a native of S. America and occurs throughout Brazil, where it has infested cotton for many years without, however, attracting much attention. Its larva bores into the roots and underground parts of the stem. In 1925 it was injuring cotton in Bahia and was also found to be common in *Hibiscus esculentus*, its original food-plants appearing to be some other Malvaceae, such as *Stylosanthes* and *Gossypium brasiliense*, from both of which it was obtained. It requires about 2 months to complete its life-cycle. During the cold weather in July and August in Bahia its development is retarded, so that cotton planted in June and July can attain a sufficient growth before attack and is better able to overcome its effects. The adult does not fly well and wanders only to adjacent plants.

The measures advocated consist in removing and burning the wild food-plants named before establishing a new cotton plantation. In existing cotton-fields it is necessary, in infested districts, to root up and burn all the old cotton plants after the harvest.

DE AZEVEDO (A.). **Estado sanitario vegetal dos Cacaoeiros em Belmonte.** [The Condition of Cacao in Belmonte as regards Pests and Diseases.] —*Correio-agric.*, iii, nos. 9–10, pp. 249–252, 270–274. Bahia, September-October 1925. [Recd. April 1926.]

Among the insects infesting cacao at Belmonte in the State of Bahia, *Heliothrips rubrocinctus*, Giard, and the Capsid bug, *Monalonion* sp. (commonly called mosquilla vastatrix), require special attention. *H. rubrocinctus* chiefly attacks the pods, and spraying with a 2 per cent. kerosene emulsion is advised. This may also be used against the Capsid, or it may be killed by singeing the pods.

Other pests of cacao include various ants, such as *Azteca chartifex*, For., and *Atta sexdens*, L.; an Anthribid, *Araecerus* (*Araeocerus*) *fasciculatus*, DeG., usually found in rotting pods; and a Pyralid, *Sylepta prorogata*, Hmps., feeding on the leaves.

BONDAR (G.). *Ceratitis capitata*, **praga do café no Estado da Bahia.** [*C. capitata*, a Pest of Coffee in the State of Bahia.]—*Correio-agric.*, iii, no. 10, pp. 277–282, 2 figs. Bahia, October 1925. [Recd. April 1926.]

Ceratitis capitata, Wied., which infests coffee-berries in Hawaii has now been found to do the same in Bahia. Though found in orchards in S. Paulo, it has not established itself in coffee there, probably because only one crop is harvested yearly. In those parts of Brazil where 3 to 5 harvests of coffee occur annually, this fruit-fly has the optimum conditions for its spread. A brief account is given of its life-history and control.

BONDAR (G.). **A broca das jaqueiras.** [The Jak-Tree Borer.]—*Correio-agric.*, iii, no. 11, pp. 302–305, 2 figs. Bahia, November 1925. [Recd. April 1926.]

The Cerambycid, *Acrocinus longimanus*, is a pest of jak (*Artocarpus integrifolia*) and kills numbers of this tree in Bahia. The adults are on the wing from September to November, and the females oviposit at a depth of one-third of an inch in the bark of suitable trees. After 7–10 days, the larvae hatch and begin feeding on the new wood below the bark. The larval stage lasts 7–8 months, and pupation then takes place at a depth of about 4 inches. The pupal stage occupies about 4 months, so that the entire life-cycle covers about a year. *A. longimanus* also infests *Ficus* sp. and *Caryocar brasiliense.* The larvae should be cut out, or killed *in situ* by means of a wire.

Ferreira dos Santos (L.). **O gergelim extinctor da formiga saúva.** [*Sesamum indicum* a Destroyer of *Atta sexdens.*]—*Correio-agric.*, iv, no. 1, pp. 9–10. Bahia, January 1926.

The planting of *Sesamum indicum* is stated to eradicate the leaf-cutting ant, *Atta sexdens*, which is a most serious pest in Brazil. The ants convey the leaves of this plant to their nests, and the fumes produced by fermentation kill them. The author has made use of this method since 1887.

Bondar (G.). **A broca da laranjeira.** [The Orange Tree Borer.]—*Correio-agric.*, iv, no. 1, p. 12. Bahia, January 1926.

A Cerambycid borer is recorded as completing the destruction of the trunks of *Citrus medica* var. *cedrata* previously withered from other causes. It resembles *Acrocinus accentifer,* which, however, bores in living wood. It is advised that all dead bark be removed and the trunks painted with a mixture of copper sulphate, 5 lb. in 3 gals. water, and lime, 10 lb. in 3 gals. water. Each solution must be made separately and then mixed.

P. L. **Les Ennemis du Cotonnier à la Martinique.**—*Agron. colon.*, no. 96, pp. 296–298. Paris, December 1925.

Native cotton (*Gossypium arborescens*) is cultivated to some extent in Martinique, especially in some parts of the south and west, and is considerably damaged by insect pests. The chief of these is *Dysdercus delauneyi*, Leth., which is sometimes so numerous that the plants are completely covered with it. *D. andreae,* L., is only found very rarely. Hand-collection is recommended, the use of insecticides being more expensive and less certain in effect. Pruning and burning dead branches and stems also limits the infestation. Minor pests include *Eriophyes gossypii*, Banks, *Aphis gossypii*, Glov., *Saissetia nigra*, Nietn., and sometimes the larvae of *Laphygma frugiperda*, S. & A.

Watson (J. R.). **Two New Thysanoptera from Cuba.**—*Florida Ent.*, ix, no. 4, pp. 53–55. Gainesville, Fla., February 1926.

Cephalothrips merrilli, sp. n., is described from a single male taken from a scale-infested coconut in Cuba. A key is given to the three species of this genus. *Frankliniella cephalica* var. *bruneri*, n., is described from both sexes taken on orange, avocado, *Hibiscus* and *Moringa,* in Cuba.

Anderson (J. B.). **The Citrus Aphid in Cuba.**—*Florida Ent.*, ix, no. 4, p. 57. Gainesville, Fla., February 1926.

The citrus aphis [*Aphis pomi,* DeG.] has been prevalent throughout the orange groves of the Central Provinces of Cuba during the past year. It must have been present in small numbers for 3–4 years, though the curling of the leaves was generally attributed to weather or other conditions.

Seamans (H. L.). **A Simple Insect rearing Cage.**—*Canad. Ent.*, lviii, no. 2, pp. 27–28. Orillia, Ont., February 1926.

Wide-mouthed fruit jars, which are sold in various sizes, make good insect rearing cages. The solid top may be replaced by a disc of screen wire or a perforated strainer fixed inside the metal ring that is provided to keep the lid on. The quart size is recommended for rearing Noctuid larvae.

Caesar (L.) & others. **Ontario Spray Calendar for Apples. The Timing of Sprays.**—*Canad. Hortic.*, Fruit & Truck edn., xlix, no. 2, pp. 27 & 28, 4 figs. Peterboro, Ont., February 1926.

The application of sprays at the correct time is always very important, and is particularly so in the case of apples, since if applied incorrectly they may prove worthless. The object of spraying at different periods is discussed, and the methods of recognising the best time are described.

Petch (C. E.). **Some Dusting and Spraying Experiments.**—*Canad. Hortic.*, Fruit & Truck edn., xlix, no. 2, pp. 29–30. Peterboro, Ont., February 1926.

Both dusting and spraying are satisfactory under Quebec conditions for scab and insect control so that the choice of one or other system must be governed by the prevailing local conditions. Flour was the best of the various materials tested to increase the adhesiveness of dusts. Calcium arsenate and lead arsenate have both given good results, but the latter is the more costly.

Ross (W. A.). **The Pear Psylla and its Control.**—*Canad. Hortic.*, Fruit & Truck edn., xlix, no. 2, pp. 30–31. Peterboro, Ont., February 1926.

Most of this information concerning the pear psylla [*Psylla pyricola*, Först.], including the preparation of a 3 per cent. oil spray, have already been noticed from another source [*R.A.E.*, A, xiii, 584]. Calcium caseinate 6 oz. may be substituted for the lime and copper sulphate in the stock emulsion.

Brittain (W. H.). **Report of the Professor of Entomology and Zoology and Provincial Entomologist.**—*Ann. Rept. Secy. Agric. Nova Scotia, 1925*, pp. 52–59. Halifax, N.S., 1925. [Recd. April 1926.]

Of the vegetable and field crop pests *Gortyna micacea*, Esp. (potato stem-borer), *Heliothis* (*Chloridea*) *obsoleta*, F. (corn ear-worm) and *Psila rosae*, F. (carrot rust fly) were prevalent and destructive.

The fruit tree pests were *Eucosma* (*Tmetocera*) *ocellana*, Schiff. (bud moth) on apples [*cf. R.A.E.*, A, xiii, 235], which in some orchards is apparently replaced by *Tortrix* (*Archips*) *rosaceana*, Harr. (oblique banded leaf-roller); *Lygus communis*, Knight (green apple bug), which is increasing in abundance, causing total loss of crop in some cases; *Alsophila pometaria*, Harr. (canker worm), which is of little importance in well sprayed or dusted orchards; *Hemerocampa leucostigma*, S. & A. (white-marked tussock moth); *Paratetranychus* *pilosus*, C. & F. (European red mite); and *Psylla* (*Psyllia*) *mali*, Schmidb. (apple-sucker). The last named will probably be less numerous next season owing to the prevalence of the fungus, *Empusa* (*Entomophthora*) *sphaerosperma*.

The work in connection with the brown-tail moth [*Nygmia phaeorrhoea*, Don.] is now entirely dependent on Federal funds and is reported on by L. S. McLaine. Though 154 nests were collected, as compared with 70 the previous year [*R.A.E.*, A, xiii, 234], they were confined to five districts.

CUSHMAN (R. A.). **Some Types of Parasitism among the Ichneumonidae.**—*Proc. Ent. Soc. Wash.*, xxviii, no. 2, pp. 29–51, 51 figs., 21 refs. Washington, D.C., 26th February 1926.

The author divides the ICHNEUMONIDAE into two main groups: External parasites, of which the eggs are laid on or near the host, the larvae feeding externally by puncturing its skin; and internal parasites, of which the eggs are laid within the body of the host, where the larvae feed. Four types of external parasites are discussed. The least specialised is that in which the host is either not stung or is permanently paralysed or killed, and the eggs are of simple form, being inserted through the plant tissue, cocoon, or pupal case surrounding the host, but not necessarily on the latter; most of the insects of this type have a wide range of hosts of similar habitats. In the second type the eggs are laid on the bodies of temporarily paralysed free-moving hosts (spiders), to which they are fastened by a secretion, the larvae keeping their position by retaining a hold on the egg-shell. The third type resembles the second except that the egg has a pedicel that is inserted into the body of the host (a Lepidopterous or sawfly larva). In the fourth type, only one example of which is known, *Grotea anguina*, Cress., the larva feeds on the larvae and bee-bread of a wild bee, *Ceratina dupla*, Say. Five types of internal parasites are discussed: in the first four the eggs are laid in the larvae or pupae, mainly of Lepidoptera, the types being distinguished by variations in the degree of their specialisation for their environment; in the fifth type, of which only one instance is known, *Bassus* (*Diplazon*) *laetatorius*, F., the egg is laid in the egg of a Syrphid, and the adult emerges from the puparium [*R.A.E.*, A, ii, 599].

CRAIGHEAD (F. C.). U.S. Bur. Ent. **The *Dendroctonus* Problems.**—*Jl. Forestry*, xxiii, no. 4, pp. 340–354. St. Paul, Minn., April 1925.

Bark-beetles of the genus *Dendroctonus* are among the most serious of forest pests. The more important species are discussed in some detail, and a good deal of work by other investigators is reviewed. *D. brevicomis* (western pine beetle) is morphologically closely allied to the southern pine beetle [*D. frontalis*], though its habits differ in many important respects. The author is convinced that it is only under exceptionally favourable and rather definite conditions that it causes really serious infestations. Generally, this beetle appears to prefer overmature, slow-growing, decadent trees, particularly those on poorer sites. The sudden appearance of newly-infested trees, either singly or in small groups in the forest, usually indicates an incipient increase, while when groups of from 10 to 50 infested trees occur it is almost certainly an indication that the infestation is about to decline. Observations also indicate that after trees have reached the age of approximately 120 years the rate of growth decreases progressively for some years until the trees succumb to the attacks of *D. brevicomis*. From the standpoint of profitable rotation, however, maturity occurs many years before the age of extremely slow growth when the trees become susceptible to attack. The indications are that bark-beetle attacks occur with definite periodicity, though this has not yet been definitely determined, and studies are being made to discover if there is any correlation between rainfall and insect outbreaks. While *D. brevicomis* is always attracted to trees scorched by fire, the broods in them suffer a high mortality, and this attraction and the mortality of the beetles on burnt trees suggest certain possibilities in developing more effective control operations. Very definite conditions are necessary for maximum reproduction; from felled trees, sawlogs and tops a very low percentage of emergence occurs; fire-scorched trees are rarely attacked if all the needles are burnt off; when half the foliage is destroyed poor emergence is the result, while trees merely scorched on the lower stem are more favourable for reproduction. Emergence from the summer generations is always greater than from the over-wintering ones. It is, therefore, only under the most favourable conditions that actual increases can occur, and the indications are that the water content or sap concentration of the phloem is the critical factor. In all cases where high mortality of the beetle occurs, either excessive moisture or desiccation obtains.

The theory that killing all the insects in a large percentage of the trees will reduce infestation in proportion to the number of trees so dealt with does not seem to hold good, because of the extraordinary reproductive powers of the beetle under favourable circumstances, and because under these conditions possibly fewer beetles are required to overcome the resistance of the tree. It may be possible that the beetle is not killing more than the annual increment of the forest, when periods of 10 to 20 years are considered, and that old and decadent trees are being protected in opposition to the laws of nature. Should these theories prove to be correct, control work will have to be abandoned except in special cases. On the poorer sites, clear cutting should be practised or a smaller reserve should be left, and these trees should be the most vigorous in the stand. This may necessitate first a preliminary light cutting to establish reproduction. Continuous logging operations, requiring a smaller working circle, would be a great help. The disposal of slash will not be necessary for the control of this insect.

The Black Hills beetle [*D. ponderosae*] is probably the most aggressive species of this genus and does not discriminate in the character of the trees it attacks, preferring, apparently, thrifty second growth, though large mature trees are readily acceptable. Attacked in autumn, the tree dies slowly, owing to the perpendicular egg tunnels and the slow extension of the transverse larval mines, which do not completely destroy the phloem until late in the following spring. In epidemics, infestation occurs in groups that are enlarged from centres and may coalesce until a whole area is wiped out. Adults emerging from a large group may suddenly migrate to some distance. Living trees are apparently required for reproduction, though felled trees and trap trees are frequently attacked. Excessive moisture or rapid drying produces high mortality, and the limits of optimum conditions for reproduction are much more restricted than with *D. brevicomis*. There is apparently no attraction to fire-scorched trees, and it is not known if weather conditions have any relation to outbreaks. Under endemic conditions, losses from this beetle are negligible. As ability to kill trees depends entirely on numbers and mass attack, direct control measures should be very effective. Merely felling trees shortly after attack could be practised in the autumn and winter months, and by systematic surveys incipient infestations could be located and promptly dealt with. It might be possible to prevent epidemics by a limited amount of logging, well scattered through the forests, as the felled logs are attractive but breeding cannot take place in them.

The mountain pine beetle [*D. monticolae*] in its bionomics resembles *D. ponderosae*. It has been known to kill entire stands of lodgepole pine [*Pinus murrayana*], white pine [*P. strobus*], and occasionally yellow pine [*P. ponderosa*]; an epidemic that began in Idaho and Montana in 1909 still shows no abatement. A decided preference is shown for mature timber, and it is doubtful if an epidemic can really develop in other than mature stands. Lodgepole pine in a mixed stand is particularly susceptible after intolerant species become dominant. Trees under 8 in. in diameter are seldom attacked. This beetle is very susceptible to drying of the bark, and in the lodgepole pine of the northern Rockies little emergence takes place above the snow line. It is not easily attracted to trap trees except large, thick-barked white pine logs, though fire-scorched trees seem to offer more attraction than to *D. ponderosae*. The possibilities of control by drying the bark of infested trees by felling and girdling have been tested, but the results are not yet known. The susceptibility of mature timber offers some hope that increased utilisation will discourage epidemics.

The southern pine beetle [*D. frontalis*] chiefly attacks second growth stands, which are of high stumpage value, so that its depredations are very serious. It appears in epidemics, destroying up to 50 per cent. of the trees over wide areas, and then for years is very rarely seen. Under favourable conditions there are 3 to 6 generations annually. The epidemics occur during drought periods or whenever an inch or more deficiency in precipitation occurs during the growing season. Outbreaks start in groups on ridges of southern exposure and rapidly spread. New generations emerging from dead trees show the same habit as *D. ponderosae* of migrating for some distance to start a new group of infested trees. Stands under 25 years of age are rarely attacked. This beetle apparently does not breed in slash or felled trees. Some peculiarity of living tissue is evidently necessary for breeding, and some abnormal physiological condition resulting from drought, possibly increased sap density, is essential. By frequent and close inspection of forests during unusually dry periods, incipient outbreaks can be detected and early control work would probably be of benefit, though the reproductive powers of the insect are enormous. Further studies of the influence of drought conditions are necessary, and it would be well to set aside certain areas where systematic annual surveys of losses from the beetle may be conducted. The capacity of this species to reduce stands of shortleaf pine [*Pinus echinata*] (the most susceptible tree) and thus encourage inferior species of trees should also be investigated.

The chief problem in bark-beetle work is to be able to tell from e character of an endemic infestation when it will become epidemic, d again, when the outbreak will subside. Systematic observations, strip surveys and comparison of the annual losses of several years, e at present the only safeguards for recognising danger from these sects. The effect of infestation by *Dendroctonus* spp. on silviculture various regions is discussed.

EIRSON (H. B.). **The Place of Entomology in Silviculture.**—*Jl. Forestry*, xxiii, no. 4, pp. 372–375. St. Paul, Minn., April 1925.

While protection from insects is one of the essential features of rest policy, many foresters still regard losses due to them with difference, though forest fires, which may cause less damage, are ttacked with vigour. Nevertheless, the attitude of the public towards rest insect control is gradually changing, and the demand for ntomological work in this connection is increasing, owners of timber land many cases financing the operations of the entomologist. The resent trend of such work is not only to control existing insect nfestations, but more particularly to prevent outbreaks. Studies re being made to correlate insect outbreaks with weather conditions hat may eventually result in the predicting of possible outbreaks everal years in advance. The possibility of controlling incipient utbreaks of softwood defoliators by girdling is being tried in the astern States and east Canada.

There is serious need of better courses on entomology in the forestry chools, and a graduate forester ought to know something of the ore important forest insects and be able to recognise their work efore it assumes epidemic form. Trained entomologists should also e placed at the forest experiment stations, to assist foresters in lanting programmes and to devise methods of management. Fre-uently a slight variation in method may prevent killing or serious njury to trees by insects ; for example, the cutting out of hardwoods o release softwood growth is an excellent preventive against loss to oftwoods from insects. The author is convinced that the control of orest insects is quite as practical as the control of forest fires, and that he successful management of forests lies in a judicious combination f fire protection, eradication of insects and diseases, and proper nethods of cutting and planting.

PERRY (W. J.). **The Spruce Budworm in New Mexico.**—*Jl. Forestry*, xxiii, no. 4, pp. 410–413. St. Paul, Minn., April 1925.

Tortrix fumiferana, Clem. (spruce budworm), although a voracious eeder on the buds of spruce, is not considered entirely noxious. Without the insect, the type of country largely populated by Douglas ir [*Pseudotsuga taxifolia*] in the south-west of the United States grows up into a jungle, with white fir [*Abies concolor* ?] usually predominating. All the short-needled trees are attacked, white fir being preferred, and the attack continues for year after year. In the present instance there is evidence that some disease among the caterpillars is weakening the outbreak after four years. The result of attack on white fir is that the tree dies from the top downward in about 10 to 12 years, and sometimes much more rapidly. Frequently a girdling beetle, such as a species of *Scolytus*, infests a tree already weakened by *T. fumiferana* and kills it. Strong young Douglas firs of pole size and upwards are seldom killed, but the growth is retarded for about a dozen years, during which time much of the white fir and weaker trees surrounding them have died out, leaving them plenty of light and moisture, while the insect outbreak also dies down, and reproduction then continues with much more rapid growth than formerly. Old trees do not possess this degree of recuperative power and may never resume normal growth. In the writer's opinion, more and better timber is produced in a stand of Douglas fir and white fir over a period of 50 years that has included an attack by *T. fumiferana* near the beginning of the period than in one that has not done so. While the type and quality of the timber is improved, however, the dead trees standing, and the fallen ones for some years afterwards, constitute a great menace with regard to forest fires. In the North and East, conditions are different, and the above remarks scarcely apply to these areas, where great damage is actually being done in stands composed largely of species susceptible to being killed by the budworm. It is, of course, essential to harvest wherever possible those species susceptible to the budworm before they reach the age where the tree's declining vitality cannot successfully resist the attack.

HEINRICH (C.). **Comments on the Distribution of the European Pine-shoot Moth.**—*Jl. Wash. Acad. Sci.*, xvi, no. 4, p. 104. Baltimore, Md., 19th February 1926.

The situation as regards *Rhyacionia buoliana*, Schiff. (European pine-shoot moth) in New Jersey, New York, Connecticut, Massachusetts and Rhode Island is summarised. This moth has been able to survive local conditions and to thrive in the United States for 13 or 14 years. It is established and well distributed on Long Island, which will remain, so long as the insect is there, a source of infestation for other places. It is also well established, though not so widespread, in Newport and its vicinity, and it has been distributed from nurseries to various private estates in New York, Connecticut, Rhode Island, New Jersey, and probably, in other localities further west. Attempts have been made to eradicate the pest by cutting buds, but this work has not been sufficiently thorough. Consequently the moth has persisted in most of the localities into which it has been introduced. It has apparently not yet escaped into the forests or into large plantations of native pines.

Dosage Tables for Cyanogas Calcium Cyanide Dust.—*Res. Devpmt. Cyanogas Calcium Cyanide*, Sect. 1, pp. 8–17, 4 tables. New York, N.Y., The American Cyanamid Co., 1925.

In early fumigation work with Cyanogas calcium cyanide under tents the dosage required for a citrus tree was determined on the basis of the dosage tables for liquefied hydrocyanic acid then in use in California. As Cyanogas calcium cyanide " A " [*R.A.E.*, A, xiv, 74] contains only half as much cyanogen as sodium cyanide, 1 oz. of which is equivalent to 1 unit (18 cc.) of liquefied hydrocyanic acid, it was assumed that the amount required would be twice the amount of sodium cyanide. Consequently, in fumigating a tree 14 feet over and 16 feet round, for which the correct dosage is 4 units of liquefied hydrocyanic acid, 8 oz. of Cyanogas calcium cyanide were used.

Subsequent experiments, however, showed that 75 per cent. of this amount is sufficient to kill the insects satisfactorily. In the tables here given, therefore, the dosage is based on the assumption that 6 oz. of Cyanogas calcium cyanide are equivalent to 4 oz. of sodium cyanide in insecticidal value. A table gives the dosages of Cyanogas calcium cyanide " A " dust in ounces required for trees measured in feet, on the basis of the table for liquefied hydrocyanic acid used in California, where the dosage required is as high as anywhere in the world. Another table, also in ounces and feet, gives the dosages required in the humid coastal regions of New South Wales, which are smaller than those needed in California. In other tables dosages are given in grams, and the tree dimensions in feet and metres.

WATSON (J. R.). **Fumigation of Citrus Trees in Florida.**—*Florida Grower*, 27th February 1926, p. 9, reprint in *Res. Devmpt. Cyanogas Calcium Cyanide*, Sect. 1, pp. 33–37, 3 figs. New York, N.Y., American Cyanamid Company, 1926.

In the fumigations with calcium cyanide carried out in Florida by the American Cyanamid Company during 1925 practically all citrus pests were killed with the exception of mealybugs. In most of the work Cyanogas citrus dust [containing not less than 30 and not more than 37·5 per cent. calcium cyanide and 25 per cent. sulphur] was used, the sulphur being added in order to get a better result against rust mites [*Phyllocoptes oleivorus*].

The trees were covered with the regular California fumigation tents, which were left on for 45 minutes. The dust was pumped under the tents; the dosage used in most cases was 75 per cent. of that of the California recommendations for " A " dust [see preceding paper]. The advantages of this method are that the calcium cyanide can be used at practically any time of the year except in the rainy season. Even with a temperature of 95° F. and a relative humidity as high as 75 per cent. the injury was seldom more serious than would have followed spraying under these conditions. The one condition that must be fulfilled in order to avoid severe scorching is that the trees be absolutely dry. This and the accurate measuring of the fumigant are the only necessary precautions. The average kill of purple scale [*Lepidosaphes beckii*] was 95 per cent.; in most cases, even in protected situations only the eggs escaped the fumigation. Of the Florida red scale [*Chrysomphalus aonidum*] 98 per cent. were killed. The fumigation was very effective against rust mites.

ESSIG (E. O.). **The Blackberry Mite, the Cause of Redberry Disease of the Himalaya Blackberry, and its Control.**—*California Agric. Expt. Sta.*, Bull. 399, 10 pp., 6 figs., 5 refs. Berkeley, Cal., December 1925. [Recd. March 1926.]

Eriophyes gracilis, Nal., is responsible for the so-called redberry disease of Himalaya blackberries; other varieties of blackberry, though growing in the immediate neighbourhood of infested plants and even interlacing with them, are not attacked by this mite. Infestation is characterised by the appearance of red berries that never ripen, though they may be used for human consumption. The mites are easily controlled by the application of 4, 6, or 8 per cent. commercial lime-sulphur, or corresponding strengths of dry lime-sulphur or soluble sulphur. The 4 per cent. solution is as satisfactory as the stronger ones, provided that the spraying is well done. The best results were obtained with dormant or early spring sprays directed against the hibernating forms before they enter the flowers and berries. Summer or autumn spraying followed by dormant spring sprays will ensure complete control. Wettable sulphur may cause slight scorching if used in the summer at a greater strength than 4 per cent. Spraying should not be done in very dry hot weather, and if possible, the plants should be irrigated before summer spraying.

SMITH (R. H.). **Can we vanquish the Codling Moth?**—*Better Fruit*, xx, no. 6, pp. 5-6 & 15, no. 7, pp. 7 & 13, 2 figs. Portland, Oregon, December 1925 & January 1926. [Recd. March 1926.]

The information contained in the first of these two articles, on the failure of lead arsenate spray to prevent newly-hatched larvae of the codling moth [*Cydia pomonella*, L.] from entering apples, has already been noticed [*R.A.E.*, A, xiii, 429]. In the above experiments all the larvae that succeeded in penetrating into the apples did so at the side, as the calyces were filled with shellac. In further tests the calyces of apple flowers were thoroughly sprayed with lead arsenate, 4 lb. to 100 U.S. gals., just after the petals had fallen. In July the apples that developed from these flowers were picked and ten newly-hatched larvae of *C. pomonella* were placed in the calyx of each; over 4 per cent. of the larvae penetrated into the apples, although they had been sprayed much more thoroughly than is possible under normal orchard conditions. In the latter part of the summer most of the eggs of *C. pomonella* are laid on the apple fruit, but in the early summer they are mostly laid on the leaves. By placing 25 larvae on the fourth leaf above each apple on a number of branches cut in June it was found that even when no spray was applied over 50 per cent. of the larvae failed to enter the apples. On other branches the leaves only or the fruit only were sprayed with lead arsenate, 2 lb. to 100 U.S. gals. water; it was found that when the leaves only were sprayed about 22 per cent. of the larvae succeeded in entering the apples, while when the fruit only was sprayed 24 per cent. entered. It is concluded that when infestation by *C. pomonella* is very severe it is not possible to control it entirely by spraying with lead arsenate, even when the work is done most thoroughly and scientifically.

KLEIN (J.). **Controlling Codling Moth in Walnuts.**—*Calif. Cult.*, lxiv, no. 21, pp. 583, 587, 1 fig., 1925. (Abstract in *Expt. Sta. Rec.*, liii, no. 9, p. 858. Washington, D.C., 1926.)

Dusting and spraying have been used for the control of codling moth [*Cydia pomonella*, L.] in walnuts with almost identical results. During 1924, 2,700 acres were sprayed in California, in some cases two applications being made. The spray consisted of 16 lb. lead arsenate, 1 U.S. pt. nicotine sulphate and 4 lb. of spreader in 400 U.S. gals. of water. It was pumped under 400 lb. pressure and reached the tops of 60- and 70-feet trees. As the eggs are all laid on the young nuts, it is necessary to spray well into the trees. An average of 27 U.S. gals. was used per tree. The average cost of spraying is about 4 per cent. of the normal crop. The damage in the sprayed areas varied from 4·2 to 7·1 per cent., as compared with 12–22·2 per cent. for unsprayed ones.

Barber (T. C.). U.S. Bur. Ent. **Preliminary Observations on an Insect of the Cotton Stainer Group New to the United States.**—*Jl. Agric. Res.*, xxxi, no. 12, pp. 1137–1147, 2 figs. Washington, D.C., 15th December 1925. [Recd. March 1926.]

Dysdercus obscuratus, Dist., has recently been found on cotton in Texas and Mexico. It does not in any way injure the cotton at present, presumably feeding only on decaying bolls and nectary glands. Other food-plants are *Sida carpinifolia*, the common ragweed (*Ambrosia artemisiaefolia*), wormwood (*A. elatior*), and *Verbesina encelioides*. The continued reduction of these wild plants is probably responsible for the sudden appearance of *D. obscuratus* in cotton fields. A detailed account is given of its life-history. The eggs are usually deposited under the surface of the ground; they hatch in about 5 days in midsummer. The average period from oviposition to the appearance of the adult is 32 days in midsummer, 55 in the autumn and 87–108 in the winter.

D. obscuratus probably occurs continuously from Central America and probably farther south, along the gulf coast of Mexico to the lower Rio Grande Valley of Texas.

Crumb (S. E.). U.S. Bur. Ent. **The Nearctic Budworms of the Lepidopterous Genus** *Heliothis*.—*Proc. U.S. Nat. Mus.*, lxviii, art. 16, no. 2617, 8 pp., 1 pl. Washington, D.C., 1926.

Details are given of the structural characters by which the larvae of the following species of *Heliothis* may be distinguished: *H. obsoleta*, F., feeding on cotton, maize, tobacco, etc.; *H. virescens*, F., on tobacco, etc.; *H. phloxiphaga*, G. & R., on lucerne, phlox and grasses; and *H. cystiphora*, Wllg., the food-plants of which are unknown.

A key is given to the larvae of the first three species.

Back (E. A.) & Cotton (R. T.). U.S. Bur. Ent. **The Use of Vacuum for Insect Control.**—*Jl. Agric. Res.*, xxxi, no. 11, pp. 1035–1041, 7 refs. Washington, D.C., 1st December 1925.

Larvae, pupae, and adults of a number of insect pests of stored products were subjected to a vacuum varying from 26 to 29 inches in a bell jar of 825 cubic inches capacity for periods of 1, 2, and 4 days, during which time the temperature ranged from 60° to 70° F., and the barometer reading from 29·3 to 29·7 inches. The adults of the Tenebrionids, *Alphitobius piceus*, Ol., *Tenebrio obscurus*, F., *Tribolium confusum*, Duv., and *T. castaneum*, Hbst. (*ferrugineum*, F.), the Dermestids, *Anthrenus fasciatus*, Hbst., *Attagenus piceus*, Ol., and *Dermestes vulpinus*, F., the Cucujids, *Laemophloeus* (*Cryptolestes*) *pusillus*, Schönh., *Silvanus gemellatus*, Duv., and *S.* (*Oryzaephilus*) *surinamensis*, L., the Curculionids, *Calandra* (*Sitophilus*) *oryzae*, L., and *C.* (*S.*) *granaria*, L., the Clerid, *Necrobia rufipes*, DeG., and the moths, *Ephestia kühniella*, Zell., *Plodia interpunctella*, Hb., and *Tineola biselliella*, Humm., were all killed in 1 day, those of *Tenebroides mauritanicus*, L., in 2 days, and those of the Dermestid, *Trogoderma tarsale*, Melsh., in 4 days. The larvae of all the above species (except *N. rufipes*, *C. oryzae*, and *C. granaria*, which were not tested), and of *Tinea pellionella*, L., were killed within 4 days, the most resistant being those of *Tineola biselliella* and *Tinea pellionella*, of which 50 and 60 per cent. respectively survived for more than a day, and the

Dermestids (except *D. vulpinus*), especially *Trogoderma tarsale*, of which 80 per cent. survived for more than 2 days. The eggs of *Tineola biselliella* were all destroyed in 4 days, although 60 per cent. survived for more than 2 days. In this and subsequent experiments there was no case in which pupae were more resistant than adults of the same species.

The above experiment was repeated under similar conditions, except that the vacuum was not allowed to fall below 28 inches. The same species of insects were used, except that *Calandra granaria* was replaced by the Tenebrionids, *Gnathocerus cornutus*, F., and *G. maxillosus*, F. The adults of all species (except *Tenebroides mauritanicus, Tineola biselliella, Tinea pellionella* and *Trogoderma tarsale*, which were not tested) were killed by an exposure of 7 hours. Adults of *Tenebroides mauritanicus* and *Tineola biselliella*, which were exposed for 24 hours were all killed. Exposure for 7 hours did not kill any larvae of *Tenebrio obscurus, Tineola biselliella, Tinea pellionella,* or *Trogoderma tarsale*, but 50 per cent. of those of *T. tarsale* and 100 per cent. of those of the two moths were killed in 24 hours ; 30 and 20 per cent., respectively, of the larvae of *Ephestia kühniella* and *Plodia interpunctella* survived exposure for 7 hours, but 100 per cent. of these and of the larvae of the remaining Dermestids and of *Laemophloeus pusillus* and *Tenebroides mauritanicus* were killed in 24 hours. Of the eggs of *Tineola biselliella* 90 per cent. survived exposure for 24 hours.

Specimens of the same twenty species of insects as were used in the last experiment (with the substitution of *Calandra granaria* for *Tenebroides mauritanicus*), placed in pill-boxes or vials stoppered with cotton, were subjected to a vacuum varying from 24 to 28 inches, in a concrete vault 8 by 8 by 8 feet, for periods of 3 to 7 days. The thermometer and barometer readings were as before. Adults of *Tinea pellionella* and *Trogoderma tarsale* were not used, but those of the other species, except some of the Tenebrionids and *Silvanus surinamensis*, were killed in 3 days ; after 5 days only 25 per cent. of the adults of *S. surinamensis* and 4 per cent. of *Alphitobius piceus* survived, and all were dead in 7 days. The larvae of *Dermestes vulpinus*, *Ephestia kühniella*, and *Tinea pellionella*, and all stages of *Tineola biselliella*, were all killed by an exposure of 3 days. All the larvae of *Gnathocerus cornutus*, *G. maxillosus*, and *Anthrenus fasciatus* were killed in 4 days, and those of *Alphitobius piceus* in 5 days. Of the larvae of *Attagenus piceus*, *Tenebrio obscurus*, and *Trogoderma tarsale*, 5, 20, and 70 per cent. respectively survived exposure for 7 days. Under the same conditions 100 per cent. of the larvae of *Plodia interpunctella*, *Ephestia kühniella*, and *Pyralis farinalis*, L., and of the adults of *Calandra granaria* and *C. oryzae*, were killed by an exposure of 2 days ; many larvae and adults of *Tineola biselliella* were killed in 2 days, but all the other insects tested were apparently only slightly affected in that time.

When insects were subjected to a 29 inch vacuum all movement ceased in all stages of all species within 2 minutes, but all recovered on exposure to the air, with the exception of the adults of *Tenebrio obscurus*, which failed to recover after being subjected to the vacuum for only 10 minutes. Most insects subjected to a 24–28 inch vacuum soon became inactive, but others remained slightly active for several days. Insects in cartons of breakfast foods and in rolls of clothing or upholstered furniture were killed as quickly as those in vials or pill-boxes.

ARBER (H. S.). U.S. Bur. Ent. **A new Cotton Weevil from Peru.**—*Proc. Ent. Soc. Wash.*, xxviii, no. 3, pp. 53–54, 1 fig. Washington, D.C., March 1926.

Eulechriops gossypii, sp. n., is described from Peru, where it attacks e stem of cotton at the surface of the ground. The larvae bore into e centre of the stalk, causing the plant to fall over.

ÖVING (A. G.). U.S. Bur. Ent. **Immature Stages of** *Eulechriops gossypii* **Barber, with Comments on the Classification of the Tribe Zygopsini (Coleoptera: Curculionidae).**—*Proc. Ent. Soc. Wash.*, xxviii, no. 3, pp. 54–62, 1 pl., 1 fig. Washington, D.C., March 1926.

The contents of this paper are indicated by its title.

USHMAN (R. A.). U.S. Bur. Ent. **A new** *Urosigalphus* **parasitic on** *Eulechriops gossypii* **Barber (Hymenoptera: Braconidae).**—*Proc. Ent. Soc. Wash.*, xxviii, no. 3, p. 63. Washington, D.C., March 1926.

The Braconid, *Urosigalphus eulechriopis*, sp. n., is described from ru.

ACK (E. A.) & COTTON (R. T.). U.S. Bur. Ent. *Anthrenus seminiveus* **Casey (Coleoptera).**—*Proc. Ent. Soc. Wash.*, xxviii, no. 3, p. 64, 1 pl. Washington, D.C., March 1926.

Anthrenus seminiveus, Casey, is recorded from Washington D.C., damaging boot-brushes and the stuffing of a couch, the padding which consisted of curled hair, Spanish moss and tow. The vae had almost completely eaten away the layers of curled ir; in all 16,397 adults and 10,002 older larvae were counted, and was estimated that the entire population, including immature vae and eggs, was not less than 100,000.

HITTENDEN (F. H.). U.S. Bur. Ent. **Notes on the Behaviour of** *Cotinis nitida*, **L., and its Bird Enemies.**—*Proc. Biol. Soc. Wash.*, xxxix, no. 5, pp. 15–18. Washington, D.C., 23rd February 1926.

Starlings are useful enemies in Washington of the larvae of *Allorrhina* *otinis) nitida*, L., which they devour at the openings of their burrows the soil. Cardinal birds have been observed to destroy the adults.

DAMS (R. L.). **The Sugar Beet in California.**—*California Agric. Expt. Sta.*, Circ. 302, 34 pp., 11 figs. Berkeley, Cal., January 1926.

Curly-leaf due to the attacks of *Eutettix tenella*, Baker, is the limiting ctor in sugar-beet production in California. The part of this bulletin aling with it has been contributed by H. P. Severin [*R.A.E.*, A, i, 80]. Various other pests attack this crop in different localities, cluding Nematodes, Tenebrionid beetles of the genus *Blapstinus*, ich may be controlled with bran mash containing sodium arsenate, my worms and cutworms, for which bran mash, as prepared for asshoppers, should be used.

Fernow (K. H.). **Interspecific Transmission of Mosaic Diseases o Plants.**—*Cornell Univ. Agric. Expt. Sta.*, Mem. 96, 34 pp., 7 pls., 10 refs. Ithaca, N.Y., December 1925. [Recd. March 1926.]

The following is taken from the author's summary: Inoculation experiments were conducted with mosaics on 19 species of plants of which 15 were Solanaceae. All but one of the species tried wer shown to be susceptible to one or more of the mosaics used. It appear that the eight mosaics, which for convenience have been designatec by letters A to H, are distinct, with the possible exception of tw which may prove to be identical. The differences between them ar shown by the species that they are able to attack and by the differen symptoms produced by them on the same species. They apparentl differ also in the ease with which they can be inoculated. A list i given of the different mosaics and the plants they may attack. Som of the data appear to indicate that apparently healthy potatoes ma carry a virus that is able to produce mosaic symptoms when transferre to other species.

Flint (W. P.). **The Season's Work for the Natural History Surve in the Control of Orchard Insects.**—*Trans. Illinois State Hortic Soc. 1925*, lix, pp. 239–247. Springfield, Ill., 1926.

The effect of the weather on insect abundance in 1925 is briefl discussed. The oriental peach moth [*Cydia molesta*, Busck] was no found in the State, and it is considered unlikely ever to become serious pest in Illinois, owing to the time at which the fruit is harveste Apples were sprayed with calcium fluosilicate, 1½ lb. in 50 U.S. gal of spray solution, in place of lead arsenate, for the control of th codling moth [*Cydia pomonella*, L.]. The regular spray schedul was followed, using calcium fluosilicate and lime-sulphur early in th season, and calcium fluosilicate and Bordeaux mixture later, for th second and third brood sprays. The percentage of codling mot injury was considerably higher on trees so sprayed than on thos sprayed with lead arsenate, but considerably lower than on unspraye trees. It may, therefore, be that calcium fluosilicate is of valu in controlling the codling moth, on account of its very low cost. I some districts injury to apples by the fruit-tree leaf-roller [*Tortr argyrospila*, Wlk.] was serious, as much as 50 per cent. of the fruit bein damaged; winter spraying with 8 per cent. lubricating oil emulsio to destroy the egg-masses gave very good results, and in 1925 le than 2 per cent. of the fruit was damaged, although the insect was abundant as in the previous year where no control measures ha been taken. The emulsion used consisted of lubricating oil, 2 U. gals., water, 1 U.S. gal., and calcium caseinate, 4 oz.; good resul were also obtained by using this emulsion in sprays for San José sca [*Aspidiotus perniciosus*, Comst.]. Using neutral oils with a paraff base, it was found that the best results were obtained from oils with viscosity ranging from 90 to 200.

By increasing the amount of lead arsenate in the regular sprays f the control of the plum curculio [*Conotrachelus nenuphar*, Hbst on apple to 2 lb. to 50 U.S. gals. of spray solution the infestation w reduced to 6·1 per cent., while on trees sprayed with the regular streng the infestation was 11 per cent., and on unsprayed trees 58·5 per cen Spraying with 1½ lb. lead arsenate and 12½ lb. New Jersey dry-m lime-sulphur [*R.A.E.*, A, xii, 48], to 50 U.S. gals. water, was mu ore satisfactory than dusting for the control of *C. nenuphar* on aches. A study of the injury to peaches known as "cat facing" as shown that it is probably caused, at least in part, by the tarnished lant bug [*Lygus pratensis*, L.]. It has been found that it is uncessary to remove grass or weeds from the bases of peach trees, nless the growth is very thick or large, before applying paradichloronzene [for the control of *Aegeria exitiosa*, Say].

OMPTON (C. C.). **Truck and Garden Insect Control.**—*Trans. Illinois State Hortic. Soc. 1925*, lix, pp. 304–317. Springfield, Ill., 1926.

The more important insect pests of vegetable crops in Illinois, and e damage that they cause, are briefly described, and directions e given for their control and for making the insecticides for use gainst them.

ARSH (R. S.). **Spraying and Pruning.**—*Trans. Illinois State Hortic. Soc. 1925*, lix, pp. 393–398. Springfield, Ill., 1926.

The first part of this paper contains an outline of the sprays required r apple orchards in Illinois, with the times at which they should be pplied.

ILLETTE (C. P.) & others. **Sixteenth Annual Report of the State Entomologist of Colorado for the year 1924.**—*Office State Ent. Colorado*, Circ. 47, 77 pp., 14 figs. Fort Collins, Colo., June 1925. [Recd. April 1926.]

Aphis forbesi, Weed (strawberry root aphis) was injurious to rawberries, apparently for the first time in Colorado. *Cyllene biniae*, Först., confined its attacks to the black locust [*Robinia seudacacia*] and did considerable damage. Infestations of *Anabrus mplex*, Hald. (mormon cricket) are limited to the north-western art of the State, and it is hoped that owing to the general efforts protecting crops little damage will result another year. *Diabrotica rgifera*, Lec. (Colorado corn root-worm) causes considerable losses o the maize crop, which might be avoided by crop rotation.

Approximately 400,000 lb. of poisoned bran mash were distributed or the control of grasshoppers in one county, and it is estimated that he campaign saved over £100,000.

Experiments for the control of *Nysius ericae*, Schill. (false chinch ug) injuring horse-radish, have been conducted by G. S. Langford. 5 per cent. nicotine dust applied very heavily killed about 50 per ent. of the insects, but the best results were obtained with a 50 per ent. calcium cyanide dust (98 per cent. mortality), though with this aterial slight scorching was noticed. In the case of nymphs migrating o other crops good results were obtained by digging a ditch in front f the insects, a small amount of water being allowed to run into it.

Lepidosaphes ulmi, L. (oyster-shell scale) has been increasingly njurious throughout the eastern half of the State. The favourite ood-plants appear to be ash and common lilac; it has not been aken on apple or pear, on which trees the strain in question is apparenty unable to exist. The experiments for the control of this scale are eported on by G. M. List. The best results were obtained with engine il emulsion, made with fish-oil soap, and with liquid lime-sulphur. n emulsion carrying 6 per cent. oil is apparently about the minimum trength that will give good results, the recommended strength being –10 per cent. The addition of calcium caseinate to lime-sulphur did not increase its efficiency. Though lime-sulphur gave good results, it cannot be recommended for use in towns, on account of the marks it makes on buildings, etc.

The work on *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) has been continued by W. P. Yetter, Jr., and J. H. Newton in different counties. Oil emulsions failed to give satisfactory results and caused considerable scorching. A number of materials, including aromatic chemicals, were tried as attractants in traps and gave promising results. A table shows the composition of the solutions used, the time applied and the number of moths caught. The comparative value of the different solutions cannot, however, be accurately estimated, as they were used for varying periods and in varying quantities. One of the most successful was made by boiling apples in water and adding to the resulting liquid sugar and some rotten apples to start fermentation. The baits are exposed in open jars. If they were systematically employed by all growers through the whole season, they should prove of great value. *Tortrix* (*Archips*) *argyrospila*, Wlk., was successfully treated in the spring of 1924 with a dormant spray of dormoil 8 gals. to 100 of water.

The control experiments against *Epilachna corrupta*, Muls. (Mexican Bean beetle) continued since 1921 [*R.A.E.*, A, x, 436] are summarised by G. M. List. Zinc arsenite was the only effective material that consistently showed no scorching. Liquid sprays proved more effective than dusts of the same materials, though the latter may be of use in light infestations. The most satisfactory combinations were 1 part arsenical to 9 parts lime, 1 to 5, and 1 part arsenical to 1 part sulphur and 4 parts lime. Calcium arsenate was the most promising dust.

The work in connection with the alfalfa Nematode (*Tylenchus dipsaci*, Kühn.) is discussed by G. Thorne. It was found that this Nematode was not the cause of sudden widespread dying out of lucerne in Colorado in the spring of 1924, which was probably due to certain climatic factors. *T. dipsaci* is not a serious menace to the lucerne industry, as it does not cause any appreciable injury to this crop until the fourth or fifth year, and thus does not arise under proper crop rotation.

The apiary inspection work is reported on by R. G. Richmond. *Galleria mellonella*, L. (wax moth) was recently taken at higher altitudes than 5,000 feet. Stored combs were successfully fumigated with hydrocyanic acid gas, approximately 99 per cent. of all stages of the moth being killed. Its parasite, *Nemeritis canescens*, Grav., occurred in considerable numbers, but did not exercise any appreciable control.

GILLETTE (C. P.) & LANGFORD (G. S.). **Control of some Scale Insects infesting Colorado Trees and Shrubs.**—*Office State Ent. Colorado*, Circ. 46, 14 pp., 8 figs., 15 refs. Fort Collins, Colo., March 1925. [Recd. April 1926.]

The contents of this paper are indicated by its title.

MARCOVITCH (S.). **The Control of the Striped Cucumber Beetle and the Mexican Bean Beetle.**—*Tennessee Agric. Expt. Sta.*, Circs 1 & 8, 2 & 2 pp., 1 & 4 figs. Knoxville, Tenn., February & March 1926.

Three proprietary forms of fluosilicate [*cf.* *R.A.E.*, A, xiii, 118] are recommended against *Diabrotica vittata*, F. (cucumber beetle) and the Mexican bean beetle [*Epilachna corrupta*, Muls.], namely, commercial sodium fluosilicate [*loc. cit.*] 1 part to 2 of hydrated lime or gypsum, applied at the rate of 20 lb. an acre, a calcium fluosilicate compound, and an extra light sodium fluosilicate, which are used undiluted at the rate of 30 and 15 lb. an acre respectively. The ordinary sodium fluosilicate caused some foliage injury to cucumbers, which they eventually outgrew, but the extra-light form did not cause any scorching. In the case of very tender young plants the dust for *D. vittata* may be applied to the ground so that as the beetles crawl under the plants they get some of the powder on their feet. In the case of *E. corrupta* the adults are more easily killed than the larvae; applications should, therefore, be made to the tops of the leaves as soon as 5 beetles to each 50 feet of row are found.

HEADLEE (T. J.). **Vegetable Plant Lice.**—*New Jersey Agric. Expt. Sta.*, Circ. 178, 30 pp., 18 figs. New Brunswick, N.J., November 1925. [Recd. April 1926.]

This is a revised edition of a bulletin on Aphids already noticed [*R.A.E.*, A, viii, 47]. Recent developments in the application of nicotine as a spray or dust are discussed.

PATCH (E. M.). **Potato Aphids.**—*Maine Agric. Expt. Sta.*, Bull. 323, pp. 9–36, 6 figs., 55 refs. Orono, Me., April 1925. [Recd. April 1926.]

Only two Aphids, and these of world-wide distribution, *Macrosiphum solanifolii*, Ashm. (potato aphis) and *Myzus persicae*, Sulz. (green peach aphis) are known to attack potatoes in sufficient numbers to cause serious injury as a direct result of their feeding, though *Aphis abbreviata*, Patch (buckthorn aphis) may do so in certain circumstances. All three are capable of spreading potato diseases under experimental conditions. There is not much danger of their infesting stored potatoes in Maine, but further south in the United States, as well as in France, England and similar climates, special precautions are necessary to protect seed potatoes.

Macrosiphum solanifolii is certainly identical with *M. cucurbitae*, Middleton, and almost certainly with *M. solani*, Kalt., but the usual name had better be retained until the synonymy has been further worked out. Its primary food-plant is the rose, from which it migrates in the summer for preference to some solanaceous plant such as potato.

In the autumn it returns to rose, on which the overwintering eggs are placed. It may, however, migrate in the autumn to strawberry, raspberry or apple and deposit eggs, though their survival is very unusual, at least under Maine conditions, though spring colonies have been reported on strawberry in New Jersey.

The summer habits of *Myzus persicae* are similar to those of the preceding species, but in the autumn it deposits the overwintering eggs on peach or plum trees. Though solanaceous plants are not preferred by this species to spinach and certain other vegetation, potatoes offer sufficient attraction to become heavily infested during seasons when the Aphids are abundant. North of the peach zone in America *M. persicae* passes the winter on other species of *Prunus*, but small and weak spring colonies are the rule. In mild climates the viviparous generations may continue in the open.

A. abbreviata thrives best on cultivated nasturtium and certain other plants, and its habits vary according to the situation of the plants attacked. In shady places it may be found on the most exposed parts of the plant, but in sunny areas it occurs almost exclusively on the lower surface of the leaves, especially the older ones. The winter is passed on buckthorn, *Rhamnus alnifolia* and *R. cathartica* being used for this purpose in Maine.

Though it would not be possible in most cases to destroy all the winter food-plants of these Aphids, thorough spraying or dusting of roses, peaches and buckthorns would greatly reduce the spring and autumn generations occurring on these plants. Preparations of nicotine sulphate have been effectively used on potato plants, but in treating them the habits of the Aphids (whether occurring on lower or upper or both surfaces of the leaves) must be borne in mind. Where roguing is practised, the plants pulled up should be treated for the destruction of Aphids or removed ; otherwise the Aphids will leave the withering plants for the healthy ones. Until it is known to what extent other potato-frequenting insects are responsible for the transmission of plant diseases, it is impossible to estimate definitely how much emphasis on Aphid control is justifiable. However, the possibility that a complete eradication of mosaic might not be attained is no reason for neglecting measures that would reduce its spread.

A key is given to Aphids occurring on potato and related plants with a list of Aphids recorded on solanaceous plants and notes on the status of the names used.

PATCH (E. M.). **The Melon Aphid** (*Aphis gossypii* **Glover**).—*Maine Agric. Expt.*, Bull. 326, pp. 185–196, 3 pls. Orono, Me., September 1925. [Recd. April 1926.]

This outline of the seasonal history of *Aphis gossypii*, Glov. (melon aphis) is based on observations during three seasons in Maine.

The eggs are deposited on orpine (*Sedum telephium* var. *purpureum*) [*R.A.E.*, A, xiv, 63] in September, the winter being passed in this stage. They hatch in the spring, and the first generations feed on this plant. They are wingless individuals, and numbers of them remain on it throughout the summer. Winged forms are produced in June ; these start fresh colonies on vigorously growing shoots of orpine on which *A. gossypii* can survive entirely, though cucurbits are more attractive to this stage. Both winged and wingless individuals appear on cucurbits and other secondary food-plants, but they are all viviparous females. The egg-laying females and males are only produced from wingless females on orpine. In certain localities or in greenhouses the species can continue without the egg stage. A list is given of the plants on which it has been observed to feed from birth to maturity in Maine.

Where possible the primary food-plant, orpine, should be destroyed, and this can be easily done by cutting the plants in midsummer and applying salt or caustic soda. On cultivated plants nicotine is recommended. All infestations in greenhouses should be fumigated, as they may become a source of heavy field infestations.

A key is given to the Aphids attacking cucurbits with notes on their synonymy. Besides *A. gossypii*, the species included are : *A. maidiradicis*, Forbes, which attacks the roots, and *A. abbreviata*, Patch, *A. rumicis*, L., *Myzus persicae*, Sulz., *Macrosiphum solanifolii*, Ashm., and *M. cyparissiae* var. *cucurbitae*, Del G., which attack parts of the plants above ground. The characters distinguishing the last two from each other are not shown in the key.

Melander (A. L.). **Division of Entomology and Zoology.**—*35th Ann. Rept. Washington Agric. Expt. Sta. 1924–25*, Bull. 196, pp. 23–24. Pullman, Wash., December 1925. [Recd. April 1926.]

Experiments against the wireworm, *Pheletes occidentalis*, have already been noticed [*R.A.E.*, A, xiii, 627].

Investigations of oil sprays have shown that the process known as refining does not increase the insecticidal value of lubricating oils. There is no apparent difference between the effectiveness of paraffin and asphalt base oils ; a medium to light oil gives the best results with eggs of the leaf-roller [*Tortrix argyrospila*, Wlk.]. Viscosity is of less importance than the distillation range in determining the value of a spray oil. A miscible type of oil gives better results than any of the mechanical emulsions. Caseinate emulsion is better than other mechanical emulsions. Cresoap can be made from either fish, animal, or vegetable oils ; its preparation is described. The addition of extra soap to a miscible oil does not alter its insecticidal qualities.

Spraying twice at half strength either with or without caseinate spreader, does not give different results from spraying once at full strength. The addition of caseinate spreader detracts from a miscible oil spray. An oil spray should be used at a strength of 7 or 8 per cent. for leaf-roller and not weaker than 4 per cent. for San José scale [*Aspidiotus perniciosus*, Comst.].

A new method of dealing with newly hatched grasshoppers was developed during the year. About 100 per cent. of them were killed by distributing granular calcium cyanide at the rate of 200 lb. an acre over the ground where they had congregated. Actual counts showed the grasshopper population to number approximately 20,000,000 to an acre in certain districts.

Webber (R. T.) & Schaffner (J. V., Jr.). **Host Relations of *Compsilura concinnata* Meigen, an Important Tachinid Parasite of the Gipsy Moth and the Brown-tail Moth.**—*U.S. Dept. Agric.*, Dept. Bull. 1363, 31 pp., 9 refs. Washington, D.C., February 1926.

This bulletin contains data on the host relations of *Compsilura concinnata*, Mg., collected since 1916, and thus forms a complement to Culver's paper [*R.A.E.*, A, vii, 428]. The date of emergence of *C. concinnata* varies greatly from year to year, according to climatic conditions, and consequently there may be only two or as many as four generations a year, although three is the usual number. The parasite has now been bred from 94 species of Lepidoptera, 6 species of sawflies, and one beetle (*Pissodes strobi*, Peck), 92 of these hosts being native American insects. Under natural conditions *C. concinnata* has been found capable of passing the winter in 16 hosts, and under laboratory conditions in 10 additional ones, all 26 being Lepidoptera. With the exception of *Schizura concinna*, S. & A., and *S. unicornis*, S. & A., which hibernate as pre-pupae, all these hibernating hosts pass the winter as pupae ; on their abundance depends, to a large extent, the number of *C. concinnata* available in the spring to parasitise the gipsy moth, *Porthetria dispar*, L., and the brown-tail moth, *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.). The most important hibernating host yet discovered is *Diacrisia* *virginica*, F., which is generally common, and sometimes found in large numbers. The larvae of *Papilio polyxenes*, F., are usually solitary, but are very suitable as hibernating hosts, as are also those of *P. troilus*, L., as many as five *C. concinnata* being known to pass the winter successfully in a single pupa of the latter, which is, however, limited in abundance by its restriction to two food-plants, *Sassafras* and *Lindera*. The summer hosts of *C. concinnata*, from which it was bred by the authors, are tabulated, to show the periods during which they are subject to attack ; although early stage larvae may be attacked successfully, those of the intermediate stage are more suitable to the development of the parasite.

Several Lymantriids are important as summer hosts of *C. concinnata*. *Nygmia phaeorrhoea* and *Stilpnotia salicis*, L., which hibernate as larvae, are first available, and a little later, *Porthetria dispar*, *Hemerocampa leucostigma*, S. & A., and *Notolophus antiquus*, L., which hibernate in the egg stage. By far the most abundant of these is *P. dispar*, and in this host the parasite multiplies very freely. The presence of *N. phaeorrhoea* rather tends to divert the attention of the parasite from *P. dispar*. *S. salicis*, an introduced European pest [*R.A.E.*, A, ix, 574], became abundant in a single year and was very little attacked by native parasites, but in certain collections of last stage larvae as many as 78 per cent. were parsitised by *C. concinnata*, while the average was over 50 per cent., compared with 2 per cent. parasitism by native insects. *H. leucostigma* is attacked by a number of native parasites, including 7 Tachinids, but *C. concinnata* is its most important parasite wherever it is established. The authors consider erroneous the supposition that where *P. dispar* is most abundant *C. concinnata* increases so much that it eventually reduces the winter hosts to such an extent as to reduce its own numbers ; this misconception is due to the fact that in areas lightly infested by *P. dispar* the percentage of the larvae parasitised is higher than in heavily infested areas, although the distribution of *C. concinnata* is probably even.

The Lasiocampids, *Malacosoma americana*, F., and *M. disstria*, Hb., which would, from their affinities with the Lymantriids and their time of appearance, be expected to be suitable hosts for *C. concinnata*, are actually very little attacked ; the tent-making *M. americana* is a more unfavourable host than *M. disstria*, but it is not this habit alone that protects it, as larvae reared in the laboratory and prevented from making tents were not attacked. The tent-making Arctiid, *Hyphantria cunea*, Dru., was, however, much more readily attacked under similar laboratory conditions than under natural ones.

More species of Nymphalids than of any other family are attacked by *C. concinnata*, and this group provides some of its most constant and favoured alternate hosts. Other Lepidoptera that are favourable summer hosts include the Pierid, *Pieris* (*Pontia*) *rapae*, L. ; the Notodontids, *Datana* spp. and *Schizura concinna* ; the Arctiids, *Diacrisia virginica*, *Estigmene acraea*, Dru., and *Euchaetias egle*, Dru., which are also good hibernating hosts ; and the Noctuids, *Apatela furcifera*, Guen., and *Cirphis unipuncta*, Haw. Tachinids play a large part in the natural control of *C. unipuncta*, and *Compsilura concinnata* appears to be nearly twice as common as the most important of the native parasites, *Winthemia quadripustulata*, F. The Sphingid, *Protoparce* (*Phlegethontius*) *quinquemaculata*, Haw., would probably be a very favourable summer host, but for the fact that it is almost invariably heavily parasitised by the Braconid, *Apanteles congregatus*, Say. According to D. W. Jones, *C. concinnata* is an occasional but unimportant parasite of *Pyrausta nubilalis*, Hb.

The Tenthredinid, *Croesus latitarsus*, Nort., may be of some value as a host of *C. concinnata*; in some cases, however, cocoons of the sawfly were found to contain adult parasites that were unable to emerge, an occurrence noted by Culver in the case of *Bombyx mori*, L.

The general conclusions of the authors are that the introduction of *Compsilura concinnata* has been a great benefit; the rapidity of its dispersion has exceeded all expectations, and it is of the greatest value in checking light infestations of the gipsy moth on the edge of the latter's area, and in controlling isolated outbreaks outside it. With a few exceptions, it has had very little adverse effect on the native parasites, and it does not seem to have upset the natural balance already existing.

DELONG (D. M.) & JONES (M. P.). **Control Measures for the Houghton Gooseberry Aphis with special reference to Plant Resistance.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 40–43. Geneva, N.Y., February 1926.

A three years' study has been made of *Myzus houghtonensis* (Houghton gooseberry aphis) in Ohio. Overwintering eggs hatch before the first leaves are conspicuous, and the young immediately begin feeding on the first leaves that appear. Galls are soon formed, which protect the Aphids from spray materials; it is, therefore, necessary to attack them immediately after hatching while they are seeking the opening buds. In 1925 the 9th of April was the best date, and at this time dormant strength sprays can be used without injury. The best results were obtained with nicotine sulphate 1 : 500; a 2 per cent. engine oil emulsion (104 at 100-paraffin base); miscible oil 1 : 15; and combinations of miscible oil and engine oil emulsion, each with nicotine 1 : 1,000, which should be well driven into the small shoots at the base and lower portions of the plant. All of these materials were effective in killing the nymphs and in preventing gall formation, but as complete extermination is practically impossible, there are always some winged individuals of the third generation that migrate in late May or early June and re-infest the gooseberry plants, for there is apparently no alternate food-plant. A resistant strain of gooseberry has been developed during the present work which is apparently indistinguishable from the typical Houghton gooseberry. These resistant plants have made more rapid growth, produced larger crops of fruit and have been more vigorous in every way than the ordinary variety.

Parasites reared from this Aphid are *Aphelinus sanborniae*, Gah.; *Lysiphlebus testaceipes*, Cress.; *Pachyneuron siphonophorae*, Ashm.; *Asaphes americanus*, Gir.; and a species of *Charips*. An unidentified Syrphid is frequently found inside the galls, but none of these enemies has effected any marked degree of control.

PORTER (B. A.). U.S. Bur. Ent. **The Tarnished Plant Bug as a Peach Fruit Pest.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 43–48, 1 pl., 4 refs. Geneva, N.Y., February 1926.

Peach blossoms and very small fruit are injured in Indiana and Illinois during the few weeks following blossoming by *Lygus pratensis*, L. (tarnished plant bug). Apparently this injury develops later in the season into the scarred and distorted condition of the fruit known as "cat-faced" peaches. In orchards adjacent to woodlands in Ontario and New York a somewhat similar injury to peaches has been caused in recent years by *L. caryae*, Knight, *L. quercalbae*, Knight, and *L. omnivagus*, Knight. These bugs pass the winter in the egg stage on their forest-tree food-plants and therefore must pass through the nymphal stages and reach maturity before migrating into the peach orchards. In the case of *L. pratensis*, on the other hand, the injury is caused by adults that have hibernated, and the feeding is done while the peaches are very small and more subject to subsequent distortion. A method of controlling the injury would be to prevent the bugs from feeding on peaches during the short period immediately following the opening of the blossoms by means of contact poisons or repellents, or to prevent the breeding of the bugs in or close to the orchards. Breeding does not occur to any extent on peach, but on various weeds and other plants. Clean cultivation would probably be of value, especially if extended to the adjacent fields. Contact poisons have never given satisfactory control.

In the discussion following the reading of this paper, it was stated that in the State of Washington there are many cases of injury by *L. pratensis* just before picking the fruit.

FLINT (W. P.) & BIGGER (J. H.). **Control of the Fruit Tree Leaf Roller with Lubricating Oil Emulsion.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 49–52. Geneva, N.Y., February 1926.

During 1924, *Tortrix* (*Archips*) *argyrospila*, Wlk. (fruit-tree leaf-roller) was so abundant on apples in western Illinois as to destroy up to 50 per cent. of the entire crop in some of the largest orchards. Experiments were therefore made to test the effect of various oils and oil emulsions on the eggs of this moth. Very high mortality of the eggs was produced by the use of 8 per cent. boiled lubricating oil emulsion and by some commercial oils. By using this strength during the dormant period in some of the larger orchards, almost complete control of the leaf-roller was obtained. In the following season, only 2 per cent. or less of the apples showed the results of attack from this pest. No bad effects followed from the spraying, and heavy crops of fruit were produced on the sprayed trees. Similar results have been obtained in Idaho and other western States [*R.A.E.*, A, xiii, 500].

HASEMAN (L.). **Codling Moth Investigations.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 53–55. Geneva, N.Y., February 1926.

The following is the author's abstract of this paper: Results, which have been secured since 1922 on the investigation of the codling moth, *Cydia* (*Carpocapsa*) *pomonella*, L., to determine what type of nozzle and what pressure places the greatest amount of arsenic in the lower calyx cup of apple blossoms, are given in this paper. These data show that a fine mist spray under 100 lb. pressure places the most arsenic in the calyx cup, though not a great deal more than in the case of coarser sprays with higher pressures. The average amount placed in the calyx cup in thorough orchard work is sufficient to provide a lethal dose for the small larvae that attempt to enter at the calyx end of the fruit.

Sullivan (K. C.). **The Use of Dusts for the Control of Apple Pests and Diseases under Missouri Conditions.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 56–59. Geneva, N.Y., February 1926.

During 1925, dusting was tried for the first time in Missouri for the control of apple pests and diseases, with very good results. Sulphur dusts were used at strengths of 90 lb. superfine dusting sulphur to 10 lb. lead arsenate or 85 lb. superfine sulphur to 15 lb. lead arsenate. Copper-lime dust was used at the strength of 80 lb. hydrated lime, 12 lb. copper sulphate and 8 lb. calcium arsenate. Half the plots received four applications and the others nine, the larger number being applied chiefly in an attempt to obtain better control of the codling moth [*Cydia pomonella*], the late summer broods of which were causing considerable trouble. The results seem to indicate that 2 lb. dust per tree will give as good control as 5 lb.; the latter amount is very expensive, and even the former costs more than spraying. Nine applications gave better results than four but proved very costly. On the whole the dust compared very favourably with liquids and may be valuable as a supplement to liquid spraying, but further tests over a period of years will be necessary.

Stafford (E. W.). **The Complexity Factor in Insectidical Measures.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 60–62. Geneva, N.Y., February 1926.

The most popular insecticides are sure to be those that have few ingredients and need few instructions for their use. Commercial insecticides for this reason are generally most satisfactory, but makers of these are recommended not to offer secret preparations. If a manufactured article is labelled for what it contains, farmers will not trouble to copy the product while the State will be willing to endorse it. Formulae that have been proved to be effective should be in the Pharmacopoeia or otherwise standardised, and in certain cases insecticidal measures should be carried out by government employees.

Safro (V. I.). **Cyanides of Calcium.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 62–65. Geneva, N.Y., February 1926.

Wide variations in results obtained in field tests with several commercial products containing calcium cyanides emphasise the necessity of greater care in identifying and recording the specific cyanides used in experimental work and in tabulating results. Only one of these cyanide products has as yet been described (U.S. Patent No. 1, 359,257, November 16, 1920, W. S. Landis), this product being made by the fusion of cyanamid with ordinary salt (sodium chloride). It is now possible to make cyanides of calcium without the agency of salt and to make it commercially pure. Greater accuracy in interpretation of field tests can be obtained by comparing the effects of the several preparations—especially those containing sodium chloride or sodium cyanide—with products free from these compounds. Field tests conducted by the author indicate the extreme advisability of checking all experiments concerned with plant injury by comparison with similar applications of the residue alone of each product. With the development of several commercial products containing calcium cyanides, each with its own method of manufacture, composition, properties, and residue, it is essential that the ingredient causing plant injury should be determined with each product used. For the present, perhaps the distinction can be made on the basis of the nature of the inert ingredients, particularly whether they contain sodium compounds or not, and also in the nature of the residue, whether containing sodium chloride or not. Some such distinction is absolutely essential, and the term calcium cyanide as a generic term for all such products is no longer an adequate description.

SMITH (R. C.). **House Fumigation with Calcium Cyanide.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 65–77, 5 refs. Geneva, N.Y., February 1926.

From experiments described it is concluded that calcium cyanide is a promising substitute for sodium cyanide for house fumigation. Eighteen fumigations were carried out against household insects over a period of two years. It was soon found that 2 lb. of Cyanogas calcium cyanide granules ("G grade") to 1,000 cu. ft. of space, applied by spreading thinly on dry papers in tightly closed rooms and left for 24 hours, would give satisfactory results. Among the insects killed by this treatment were fleas, bed-bugs [*Cimex*], ants (*Lasius* (*Acanthomyops*) *interjectus*), cockroaches, clothes moths, etc., as well as various insects taken by sweeping out-of-doors and brought into the houses for the test. Cockroaches were found in one house after treatment, but this was most likely re-infestation from neighbouring premises. The Angoumois grain moth [*Sitotroga cerealella*] proved resistant to this fumigation, as it also is to hydrocyanic acid gas.

The American Cyanamid Co. states that calcium cyanide granules contain not less than 40 per cent. nor more than 50 per cent. calcium cyanide, and it seems highly probable that the remaining 50 or 60 per cent. of the product consists largely of unconverted $CaCN_2$, or calcium cyanide and some calcium hydroxide. The reactions of calcium cyanide with water are discussed.

In some of the fumigations described, tarnishing of metals and discoloration or spotting of walls occurred in a few cases; this was probably due to excess of water present. An exact knowledge of the chemical reaction of the product with water is required. This method costs about one-third less than sodium cyanide fumigation and is simpler and less dangerous. The odour, however, persists in houses for from one to five days or more. Calcium cyanide should be weighed out-of-doors, and this should be done rapidly, as gas is already being given off. The material should be scattered very thinly on the papers as granules that are covered up do not give off so much, if any, of the gas. Small granules were apparently better than flakes or larger granules. Newspapers should be spread thickly on floors before treatment as the cyanide may stain through one or two thicknesses. Rooms should be well aired before entering them; an electric fan is useful for this purpose.

EDDY (C. O.). **Studies of some Adsorbed Insecticides.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 77–86. Geneva, N.Y., February 1926.

Experiments at South Carolina Experiment Station have shown that chewing insects, such as *Leptinotarsa decemlineata*, Say (Colorado potato beetle) and *Epilachna corrupta*, Muls. (Mexican bean beetle) can be killed and controlled by adsorbed insecticides. Soluble arsenicals (sodium arsenate, sodium arsenite, potassium arsenate and potassium arsenite) with various carriers were used. The amount of arsenical required to make a dust of a given arsenic content was dissolved with the quantity of water that would thoroughly wet the carrier, which was then added to the solution and mixed with it quickly, vigorously and thoroughly. The mixture was then dried in a gas oven at a temperature ranging from 176–212° F. Eighteen to 36 hours were usually required for drying. When dry the material was hard and flinty and had to be broken up and ground and then sifted in order to secure a uniform dust material. Nine dusts containing different quantities of arsenic were made, using each carrier with each arsenical, and each when completed was analysed for total arsenic and water-soluble arsenic. The adsorbed or retained arsenic was obtained by subtracting the water-soluble arsenic from the total arsenic. The results of these analyses are given. The quantity of arsenic retained or adsorbed by kaolin, diatomaceous earth, Fuller's earth, talc and tripoli was found by analysis to be only between 0·17 and 0·42, with a general average of 0·24. The amount of arsenic retained depends chiefly on the kind of carrier and to a less extent on the form of arsenic used. Diatomaceous earth and Fuller's earth each adsorbed about half as much arsenic as kaolin, while talc and tripoli adsorbed about equal quantities, which amounted to only about 75 per cent. of that adsorbed by diatomaceous or Fuller's earth and about 37 per cent. of that adsorbed by kaolin. Apparently the greatest quantity of arsenic was adsorbed from sodium arsenite, and the least from potassium arsenite, but a good many irregularities in the results indicate that this relationship may be questioned. When the carriers are allowed to stand in large excesses of arsenical solutions of about the same arsenic content and then filtered and washed, the analysis for the total arsenic varies chiefly with the carrier and less so with the arsenical. Kaolin carried the largest quantity of arsenic from the solutions ; diatomaceous earth about 50 per cent. as much ; while tripoli, talc and Fuller's earth carried the least arsenic—that is, about 20 per cent. as much as diatomaceous earth or 10 per cent. as much as kaolin. Apparently the greatest quantity of arsenic was carried out of the solutions by the carriers when sodium arsenate was used, less when potassium arsenate or arsenite was used and least when sodium arsenite was used. The differences in these figures are not so pronounced as those recorded in comparing the carriers, and therefore the relationship may be more indefinite and even variable. The quantity of arsenic carried out of solution was larger on the average than that adsorbed or retained by the carriers in the former experiments.

The experiments have demonstrated that the relation between soluble arsenicals and the carriers used is variable and can be modified. Some of these combinations have killed insects without scorching plants, but it has not yet been determined which is the ideal relationship between arsenical and carrier from these points of view.

Regan (W. S.). **The Present Status of Oil Spraying in the Northwest.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 86–94, 3 refs. Geneva, N.Y., February 1926.

Oil sprays for dormant application on fruit-trees became very popular in 1924, but quickly fell into disfavour, largely because they were prepared by inexperienced growers who had not realised that the kind of emulsifier and the method of emulsification of an oil spray are practically as important as the oil itself, and that the sprays are best when prepared by an insecticide chemist or trained entomologist.

Later it was stated that a combination of 1 per cent. dormant type caseinate oil emulsion (with two-thirds per cent. actual oil content) with lead arsenate in the cover sprays for apples would control Aphids and kill the eggs of the codling moth [*Cydia pomonella*, L.]. Tests, however, indicate that this amount of brown neutral oil in the caseinate emulsion has little insecticidal effect upon apple Aphids, and complete mortality was not obtained even when the oil content was increased to 1½ per cent. The oil emulsion with lead arsenate is not so good a spreader as might be expected, and the presence of much free oil in an emulsion of this type is likely to throw the lead arsenate out of suspension and result in a very poor protective covering. As an ovicide for codling moth the oil combination was not highly effective and showed little or no improvement over lead arsenate alone, possibly owing to its rapid volatility. Moreover, even the lower strength was liable to cause injury to fruit by russeting or spotting, especially in the case of apples, pears and prunes and when used as a first cover spray on trees that still retained a residue of lime-sulphur applied for dormant treatment. This resulted in an unusually heavy drop of young fruit. The application of oil spray to growing plants retaining residues of sulphur in any form is almost certain to result in injury.

The author has recently made tests of a highly refined, colourless oil emulsion, containing 83 per cent. of colourless oil. Applications were made at from 1 to 5 per cent. strength on apples and from 1 to 4 per cent. on peaches prunes and cherries, in all cases with foliage and fruit on the trees. At 4 per cent. it was found to offer a safe and effective substitute for dormant lime-sulphur or dormant spray oil against San José scale [*Aspidiotus perniciosus*, Comst.], and can be applied with safety at this strength up to the time the blooms begin to open. Care should be taken not to apply any oil spray before the time for the second cover spray on trees with a residue of lime-sulphur from the dormant application. Control of Coccids should be attempted before the fruit becomes infested, which is usually early in June. On apples, control becomes very difficult after the young migrate to the fruit because the young scales seek the stems and calyx ends, where it is almost impossible to reach them. After fruit has become infested, two applications, the first at 2½ per cent., and the second 3 to 4 weeks later at 1½ to 2 per cent. strength, appear to give better results than a single application of higher percentage. It usually requires from 1 to 2 months for scale blemishes on fruit to disappear. There seem to be two generations of San José scale in the north-west of the U.S.A., the young of the first generation appearing in June and those of the second in late July and early August. If the first application is made about 2 weeks after the first young appear and the second 3 to 4 weeks later, complete control of this pest should be obtained. Applications of higher percentages (3 per cent. or more) of this oil spray during intensely hot weather are likely to result in small or discoloured fruit. Pears, peaches, prunes and cherries seem less likely than apples to react unfavourably to applications at greater strengths ; healthy and well-watered trees suffer least in this respect.

As an ovicide for codling moth, apparently 1 to 1½ per cent. strength of this colourless oil would be satisfactory, though the lowest effective strength has not been definitely worked out. This spray combines with lead arsenate for the cover sprays, which should be used as soon as it is known that eggs are being deposited. It seems possible that the oil has a residual repellent effect that keeps the moths from ovipositing, this repellent action apparently lasting from several days to several weeks, according to the percentage of oil used. Applications of 1 to 1½ per cent. strength also gave excellent control of red spider [*Tetranychus*] on apples, prunes and cherries.

HOUSER (J. S.). **The Care of Samples used in scoring the Results of Dormant Sprays for the San José Scale.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 94–95. Geneva, N.Y., February 1926.

The author points out that particular attention should be paid to moisture conditions in taking Coccid records. He has found in the case of *Aspidiotus perniciosus* that in the presence of natural or artificial moisture dead scales become plump and juicy and assume the appearance of living ones. Counts in the field should therefore be made only from absolutely fresh material, and these counts should not be made immediately following rain, as records taken under those conditions might be very misleading as to the percentage of living scales.

BALL (E. D.). **The Life Histories of Two Leafhoppers, a Study in Adaptation.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 95–99, 1 fig. Geneva, N.Y., February 1926.

Details are given of the life-histories of *Alebra albostriella* and *Erythroneura maculata*, showing that the number of annual generations of these Jassids is not determined by the length of the season, but rather by some specific adaptation to some period in the development of their food-plants. Japanese maple, beech and hickory are all trees that put out most of their foliage during a few early weeks of spring, and the single generation of *A. albostriella* has apparently been advanced to the extreme limit in order that the nymphs may coincide with the tender, growing leaves. The sycamore, on the other hand, continues to develop new foliage through a long period, and the generations of *E. maculata* have been retarded into the later summer when there will be an abundance of the older, mature foliage which this species prefers. Moreover, *A. albostriella* spends 10 months or more of the year in the egg stage in the bark, while *E. maculata* may pass even as much as 12 months in the adult stage, oviposition being both delayed and prolonged until the time of abundant mature foliage arrives.

OSBORN (H.). **Notes on the Economic Status of certain Cuban Homoptera.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 99–106. Geneva, N.Y., February 1926.

The author has made a study of the Homopterous fauna of Cuba, with especial reference to association with the sugar-cane crop. Native grasses are the natural food-plants of many of the species that are found on cane and may serve as hosts to such plant diseases as mosaic ; it is therefore important to discover the food-plants and extent of migration, as well as the possible limit of food-plants, for such species. *Stenocranus saccharivora*, Westw. (West Indian cane leafhopper) and *Draeculacephala sagittifera*, Uhler (cane arrow leafhopper) are the only species found on cane in all stages and in such numbers and conditions as to indicate that they are permanent feeders on this crop or mainly dependent on it for development. Notes are given on the more important grass-feeding species, namely, *Kolla*

(*Cicadella*) *similis*, Wlk., *Xerophloea viridis*, F., *Deltocephalus flavicosta*, Stål, *D. sonorae*, Ball, *Euscelis obscurinervis*, Stål, and *Chlorotettix viridis*, Van D., and on the less important, *Draeculacephala mollipes*, Say, *Euscelis obtusus*, Van D., *E. bicolor*, Van D., *Thamnotettix colonus*, Uhler, *Cicadula maidis*, DeLong, *Eugnathodus guajanae*, DeLong, *Oliarius franciscanus*, Stål, *Peregrinus maidis*, Ashm., *Liburnia teapae*, Fowl., and *Tomaspis bicincta*, Say. Sweet potatoes, an important Cuban crop, are largely infested with *Empoasca fabae*, Harr., and there are many garden crops that suffer injury, such as carrots from *Protalebra braziliensis*, Baker, and maize from *Cicadula maidis*, and sometimes from *Peregrinus maidis*.

KNIGHT (H. H.). **On the Distribution and Host Plants of the Cotton Flea-hopper** (*Psallus seriatus*, **Reuter**) **Hemiptera, Miridae.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 106–108. Geneva, N.Y., February 1926.

The author has discovered that the natural food-plants of the Capsid, *Psallus seriatus*, Reut., which has recently been recorded as injuring cotton in Texas and other southern States [*R.A.E.*, A, xii, 586], are various species of *Croton*, especially *C. texensis*. A description of the adult is given, and its distribution in the United States is discussed.

ISELY (D.). **Early Summer Dispersion of the Boll Weevil.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 108–112. Geneva, N.Y., February 1926.

The following is the author's abstract of this paper : The dispersion of the cotton boll weevil, *Anthonomus grandis*, Boh., in a field after the hibernating weevils have become established is periodic. Each period of dispersion coincides with the emergence of a new brood of weevils. The spread of weevils across a field is usually direct from plant to plant or row to row, and is not the result of long flights. Newly emerged weevils do not usually migrate until sexual maturity is attained. This information has been used in locating infestations at the beginning of the second and third periods of dispersion and in timing dust applications. Small infested areas dusted before weevils reached sexual maturity resulted in apparent extermination of infestation.

HINDS (W. E.). **Progress in Cotton Boll Weevil Control.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 112–121, 1 pl. Geneva, N.Y., February 1926.

In the cotton belt of the United States the loss in cotton yield due to the cotton boll weevil, *Anthonomus grandis*, Boh., has in the past averaged from 20 to 40 per cent. of the normal production, representing a very large increase in the cost to the consumer. As a result, however, of concerted action by all parties concerned, and owing to the establishment of a safe and dependable programme for cotton production and weevil control, a permanent system of agriculture for the cotton belt is now being followed, involving the continued production of cotton on a more economic basis and the assurance of a fair profit to the grower and more reasonable prices of cotton products for the consumer. Dusting by aeroplanes has given excellent results in trials and will probably become an important method of control in the near future. *Aphis gossypii*, Glov., which is frequently very abundant, an be controlled at the same time by adding to the calcium arsenate ust used against the boll weevil nicotine sulphate in the proportion f 94 parts (weight) of calcium arsenate with 6 parts of nicotine sulphate 40 per cent.), that is, practically 1 lb. of calcium arsenate to 1 oz. icotine sulphate. Over 98 per cent. of the Aphids are destroyed y an application of 8–9 lb. of the dust per acre.

KELLY (E. G.). **The Creosote-Calcium-Cyanide Chinch Bug Barrier.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 121–123, 2 pls. Geneva, N.Y., February 1926.

The creosote-calcium-cyanide barrier against *Blissus leucopterus*, Say (chinch bug) [*R.A.E.*, A, xiv, 166] has been used with great uccess in 30 counties of Kansas. The construction and maintenance f the barriers are explained.

CRAWFORD (H. G.) & MCLAINE (L. S.). **The Status of the European Corn Borer in Ontario (1925).**—*Jl. Econ. Ent.*, xix, no. 1, pp. 124–127. Geneva, N.Y., February 1926.

During 1925, *Pyrausta nubilalis*, Hb. (European corn borer) extended ts range in Ontario beyond the quarantined area of 227 townships, 25 fresh townships becoming involved. It is expected that the extension will continue in much the same proportion in 1926. The farmers are very slowly adopting control measures, and there is a tendency to wait for legislative action before undertaking any vigorous campaign.

Section of Apiculture.—*Jl. Econ. Ent.*, xix, no. 1, pp. 130–181. Geneva, N.Y., February 1926.

The section of Apiculture included the following papers: Research in Apiculture, by R. L. Webster; The California Buckeye and its Relation to the Hive Bee, by G. H. Vansell; The Chronological Distribution of the Beemoth [*Galleria mellonella*], by F. B. Paddock; The Diseases of the Adult Bee, by C. P. Dadant; Results from the Use of a Water-Soap-Formalin Solution for Sterilising American Foulbrood Combs, by G. H. Vansell; and *Braula coeca* in Maryland, by V. N. Argo.

A study of the last-named fly in 1925 was carried out on bees in cages. The parasites were observed to rest on the thorax of the bee. In feeding, they ran to the bee's face and clawed at the labrum until the bee straightened out its tongue, when they moved rapidly forward, applying their mouthparts to the base of its tongue. It has been stated that the eggs are scattered over the combs rather indiscriminately, but the author's observations showed them to be lightly attached to the underside of the capping of honey cells, apparently just before the cell was completely sealed over. During the first week in September, queens were found to be heavily infested, the newly emerged *B. coeca* seeking out the queen during the period in which its chitinous covering s hardening. Newly introduced queens were as heavily infested by 20th October as their predecessors had been, the clustering of the parasites on the queens at this season probably retarding oviposition and largely defeating the purpose of requeening. This fly seems to be definitely increasing from one season to another.

HORSFALL (J. L.) & THOMAS (C. A.). **A Preliminary Report on the Control of Wireworms on Truck Crops.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 181–185. Geneva, N.Y., February 1926.

Further experiments with calcium cyanide as a soil fumigant against wireworms [*R.A.E.*, A, xii, 179] have shown that in Pennsylvania, where the genera *Pheletes* and *Agriotes* have been very troublesome on vegetable crops, the best results are obtained by the use of a trap bait in the spring, followed by an application of granular calcium cyanide before the crops are planted, the cyanide being drilled in. Summer treatments of cabbage and celery are not recommended owing to injury to the plants. Autumn treatments have not as yet proved successful, largely because the insects are buried deep in the soil at this time.

Hessian Fly Conference.—*Jl. Econ. Ent.*, xix, no. 1, pp. 185–188. Geneva, N.Y., February 1926.

This is an account of a Hessian fly conference held in Missouri in December 1925, and discusses the situation in various States in connection with the Hessian fly [*Mayetiola destructor*, Say], with special regard to the fly-free dates for sowing wheat in the various regions.

CHITTENDEN (F. H.). U.S. Bur. Ent. **An Instance of severe Injury by the European Horseradish Webworm.**—*Jl. Econ. Ent.*, xix, no. 1, p. 189. Geneva, N.Y., February 1926.

A case is reported from Pennsylvania of severe injury to turnips by the caterpillars of *Evergestis straminalis*, Hb., which had eaten the leaves and then riddled the roots. This is apparently the first record of this moth in Pennsylvania.

WILCOX (J.). **A Suggestion as to how Phytophagous Insects may ingest Powdered Poison.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 189–190. Geneva, N.Y., February 1926.

It was found that adults of *Diabrotica soror*, Lec. (western twelve-spotted cucumber beetle), when made to walk over powdered lead arsenate on their way out of a test-tube, cleaned the powder from their tarsi by passing them between the mandibles, and many were found dead either before or shortly after leaving the poisoned area.

VAN LEEUWEN (E. R.). U.S. Bur. Ent. **A Preliminary Note on the Attractiveness of Acetic Acid to the Japanese Beetle.**—*Jl. Econ. Ent.*, xix, no. 1, p. 190. Geneva, N.Y., February 1926.

Paris green seems to have some attraction for the Japanese beetle [*Popillia japonica*, Newm.], and as acetic acid has somewhat the same odour, it was tried as an attractant. While foliage sprayed with water only attracted 26 beetles, that sprayed with water and acetic acid attracted up to 118 beetles, the attraction proving strongest during the first half hour after the acid was applied. The practical application of this method and the proper dilution to be used have still to be worked out.

CHAMBERLIN (F. S.) & GARRISON (G. L). U.S. Bur. Ent. **Corn Meal as an Attractant to the Tobacco Budworm,** *Heliothis virescens,* **Fab.**—*Jl. Econ. Ent.*, xix, no. 1, p. 191. Geneva, N.Y., February 1926.

As maize meal has proved to be the most attractive carrier for lead arsenate against *Heliothis virescens,* F. (tobacco budworm) [*R.A.E.*, A, vi, 214], experiments with it have been conducted. Some larvae were confined in jars containing fresh tobacco leaves and also a small quantity of the standard budworm poison (1 pt. lead arsenate to 74 parts maize meal), so that they could feed equally easily on either, and others with fresh tobacco leaves only. After four days, of those with tobacco leaves only, 1·1 per cent. had died, while of the others all were dead.

FELT (E. P.). **Evergreen Span Worm,** *Nepytia canosaria,* **Walker.**—*Jl. Econ. Ent.*, xix, no.1, p. 191. Geneva, N.Y., February 1926.

It is pointed out that the correct name of the Geometrid moth recently recorded as *Nepytia contracta,* Wlk. [*R.A.E.*, A, xiii, 633] is *N. canosaria,* Wlk.

LEACH (J. G.). **The Relation of the Seed-corn Maggot** (*Phorbia fuscipeps* **Zett.**) **to the Spread and Development of Potato Blackleg in Minnesota.**—*Phytopathology*, xvi, no. 3, pp. 149-176, 1 pl., 13 figs., 30 refs. Lancaster, Pa., March 1926.

Observations in Minnesota extending over three years have revealed a close association between *Phorbia cilicrura,* Rond. (*fuscipeps,* Zett.) and potato blackleg. This fly infests a wide range of plants, including potatoes, and a soft rot of the tissues follows its attack. The eggs are deposited on, or in, the soil near healthy seed-pieces or sprouts. They are commonly contaminated externally with plant-pathogenic bacteria. The larvae inoculate the seed-pieces with the bacteria and aid the development of the disease by destroying or preventing the formation of wound cork. The bacteria are constantly associated with the insect, passing through the pupal stage, and emerging with the adult fly in a virulent state. Pathogenic bacteria are commonly present in the intestinal tract of adult flies.

Sterile larvae, obtained from surface sterilised eggs, were not able to grow on sterile potato tubers, but grew normally when bacteria were added, showing that the bacteria are essential for their development. Typical blackleg was produced by infecting healthy seed-pieces with eggs of the fly. The association between the bacteria and the insect appears to be one of mutual symbiosis, and constitutes a type of insect transmission of a bacterial plant disease not previously described. No measures for the control of this fly are recommended, although preliminary experiments indicate that a thin coating of mercury bichloride over the surface of cut seed-pieces may be effective in preventing injury.

Barber (G. W.) **Some Factors responsible for the Decrease of the European Corn Borer in New England during 1923 and 1924.**—*Ecology*, vii, no. 2, pp. 143-162, 2 figs., 2 refs. Brooklyn, N.Y., April 1926.

The decrease of *Pyrausta nubilalis*, Hb., in New England in 1923 and 1924 is believed to have been caused by an association of various factors. Climatic conditions were unfavourable, and natural enemies destroyed large numbers in all stages.

Burning the crop refuse containing larvae and ploughing in the stubble to a depth of six inches or more is the most effective artificial control. Cattle may be fed on infested stalks. Trap crops planted early and late planting of the main crop decreases the extent of infestation.

Melander (A. L.), Spuler (A.) & Green (E. L.). **Investigations on Oil Sprays, 1925.**—*Washington Agric. Expt. Sta.*, Bull. 197, 19 pp., 2 figs., 3 refs. Pullman, Wash., February 1926.

These investigations form a continuation of those previously noticed [*R.A.E.*, A, xiii, 82]; field tests were made with San José scale [*Aspidiotus perniciosus*, Comst.] and eggs of the fruit-tree leaf-roller [*Tortrix argyrospila*, Wlk.]. The toxicity of lubricating oils was found to depend on boiling ranges, the best being those that distil slightly over 50 per cent. between 240° and 300° C. at 40 mm. pressure (432° and 572°F. at 1·73 inches pressure) and slightly over 25 per cent. below 240°C., viscosity, specific gravity and source (whether asphalt or paraffin base) having only an incidental effect on the insecticidal value. These are medium oils, such as that known as medium red engine oil. The addition of 25 per cent. kerosene to an oil of this nature, to lower viscosity and increase penetration, did not improve its toxicity as it acted as a diluent.

The superiority of potash fish-oil soap over soda fish-oil soap as an emulsifier is discussed, and a formula for making it is given. Whale-oil, cottonseed oil, cod-liver oil or red oil (oleic acid) may be used instead of fish-oil ; comparative tests with the first three of these and fish-oil in oil sprays showed that the value of the spray is not materially altered by the use of any one of them. Whale-oil makes a soap more quickly than fish-oil. Potash soap will not mix with oil to form a clear miscible oil unless it is first liquefied ; this can be done by adding cresol (crude cresylic acid being as satisfactory as the more refined forms), the result being the liquid named cresoap by the authors [*loc. cit.*]. Cresoap can also be made by mixing the ingredients directly as follows : dissolve 5 lb. caustic potash in 5 lb. water (heating if necessary) and add the solution to 25 lb. fish-oil or other oil and 25 lb. cresol, mixed cold, and brought nearly to boiling, stirring for a moment to ensure thorough mixing.

Alcohol can be used in place of cresol to liquefy soap and make it soluble in oil, according to the following directions : dissolve 8 lb. caustic potash in 5 lb. water and mix the solution with a cold mixture of denatured alcohol, 20 lb., and red oil, 25 lb. (red oil being preferable to fish oil) ; the reaction is violent and heat is generated, and the emulsifier should be allowed to cool slightly before being mixed with lubricating oil. Emulsions of oil with this preparation are as good as those made with cresoap, but have not been tested in the field.

The insecticidal value of a miscible oil is not increased or affected by the addition of extra cresoap emulsifier, although it may mix more easily with water ; the same result can, however, be accomplished by more careful manipulation with the necessary amount of emulsifier (1 part emulsifier to 9 parts lubricating oil). The dilution of a miscible oil should be done carefully, by adding, at first, small quantities of water to the emulsion.

Of the non-soap emulsifiers, calcium caseinate is the best, being superior to glue or eggs for the purpose. Calcium caseinate 1 lb. is churned in a little water and the remainder of 4 gals. water added when it is dissolved ; the mixture is then pumped with 8 gals. lubricating oil until the emulsion is obtained. Emulsions of this type are inferior to those made with soap emulsifiers, as they are less stable and stratify on standing.

Theoretically the addition of calcium caseinate, as a spreader, to a miscible oil is incorrect, as it reacts chemically with the soap to form a calcium soap, liberating oil, and in practice it decreases the insecticidal effect. Additional calcium caseinate may, however, be added to a calcium caseinate and oil emulsion spray with advantage. Double applications of miscible oil sprays at half strength did not give results sufficiently better than single applications to make them worth while, the difference in control being very slight. Tests of miscible oil sprays at various strengths showed that the oil content should be not less than 7 per cent. for the control of eggs of *T. argyrospila* ; at more than 8 per cent. it might damage the trees ; at this strength more than 99 per cent. control can be obtained, and it is doubtful whether 100 per cent. control could be obtained at any strength harmless to the trees, as some egg-masses are particularly resistant owing to an extra heavy waxy covering. In sprays for the control of *A. perniciosus* the oil content should not be less than 4 per cent.

MELANDER (A. L.) & SPULER (A.). **Poisoned Baits for Strawberry Root Weevil.**—*Washington Agric. Expt. Sta.*, Bull. 199, 22 pp., 8 figs. Pullman, Wash., February 1926.

Serious damage to strawberries in Washington is caused by the weevils, *Otiorrhynchus* (*Brachyrhinus*) *sulcatus*, F., and *O.* (*B.*) *ovatus*, L., and, less commonly, by *O.* (*B.*) *rugifrons*, Gyll. The larvae feed on the roots of strawberry and also of cranberry, and the adults damage the fruit. The adults all emerge just before, or at the time that, the strawberries are ripe, and for a few weeks they are active and voracious at night. It is at this time that baits can be used to control the weevils, as shortly afterwards the fertile eggs are laid, and larvae are occasionally produced viviparously. Some weevils hibernate as adults and lay eggs in the early spring ; to control these, baits would have to be applied in April.

Tests made in cranberry bogs of a large number of baits showed the superiority of natural fruits over artificial fruit odours for attracting the weevils. Subsequent tests were made in strawberry fields ; dried apple was found to be the most attractive fruit, and magnesium arsenate the most effective of a number of poisons ; the latter is convenient for mixing with the dried apple, is not repellent to the weevils and kills them quickly. In laboratory tests zinc arsenite was as effective as magnesium arsenate ; in default of both of these sodium fluoride or calcium arsenate could be used. It is not necessary for the baits to contain more than 5 per cent. of the poison, and their attractiveness is not materially increased by the addition of odorous substances; a number of substances are classed as repellent, inert, or attractant, according as whether more, as many, or fewer weevils were killed by baits to which they were added than by the baits alone. The dried apples should be ground or powdered, and for this purpose apples in which the moisture content is about 12 per cent. are preferable to those usually obtainable, which contain about 21 per cent. moisture. The moisture content can be reduced by further drying the apples in the sun or in an oven. The bait should be scattered broadcast at the rate of 70 lb. per acre.

BAILEY (I. W.). **The Spruce-budworm Biocoenose. I. Frost Rings as Indicators of the Chronology of specific biological Events. II. Structural Abnormalities in** *Abies balsamea.*—*Bot. Gaz.*, lxxx, no. 1, pp. 93-101, no. 3, pp. 300-310, 6 pls., 3 figs., 6 refs. Chicago, Ill., September and November 1925. [Recd. April 1926.]

Analyses of the growth rings in stems of spruce and balsam fir (*Abies balsamea*) have proved of considerable significance in studying the disastrous effects of *Tortrix* (*Cacoecia*) *fumiferana*, Clem., in the coniferous forests of Maine and eastern Canada. These stem analyses have provided the most reliable method of dating the advent of serious infestations in various forest areas. In addition they have afforded useful criteria in estimating the quantitative effects of varying intensities and durations of defoliation upon the growth and productivity of trees in sample plots.

ROARK (R. C.). **Fluorides vs. Fluosilicates as Insecticides.**—*Science*, lxiii, no. 1634, pp. 431-432, 8 refs. Garrison, N.Y., 23rd April, 1926.

Since the results obtained by using sodium fluosilicate as an insecticide against *Epilachna corrupta*, Muls. [*cf. R.A.E.*, A, xiii, 118] have varied greatly, and foliage injury has been caused by other chemicals in the commercial product, it is suggested that less soluble fluorides, such as those of strontium, magnesium and calcium, should be tried. The results of experiments with these have been encouraging.

MARCOVITCH (S.). **Supplementary Investigations of the Fluosilicates as Insecticides. With Observations on the Effect of Heat and Drouth on the Mexican Bean Beetle.**—*Tennessee Agric. Expt. Sta.*, Bull. 134, 13 pp., 1 fig., 8 refs. Knoxville, Tenn., January 1926. [Recd. April 1926.]

Since the publication of the author's previous paper on fluosilicates [*R.A.E.*, A, xiii, 118], sodium fluosilicate and calcium fluosilicate have been produced on a commercial scale. Two brands of the former, known as "light" and "extra-light," are mixed with 15-20 and 25-30 per cent., respectively, of alumina. The "extra-light" mixture, when undiluted, is sufficiently toxic for many insects, but is not of much value against insects that feed sparingly, such as the boll weevil [*Anthonomus grandis*, Boh.]; it does not, however, cause foliage injury to beans, cotton, or cucumbers, although it seriously injures tobacco.

he size of the particles of the various fluosilicates is discussed; the riginal sodium fluosilicate used is rather heavy, but dusts well when ixed with hydrated lime, which has also good sticking qualities, robably owing to the fact that it readily changes to calcium carbonate n exposure to the air. The calcium fluosilicate particles are small bout 5 microns), but being round and porous they do not settle well n leaves.

One mixture sold as " calcium silicofluoride C.P." was found to conain 30 per cent. soluble calcium fluosilicate and 70 per cent. calcium uoride and silica; the soluble calcium fluosilicate caused severe liage injury. When a phosphate is introduced into a solution of alcium fluosilicate, precipitation takes place; this is the explanation f the comparative insolubility of another calcium fluosilicate, hich is sold under the name of " calcium fluosilicate comound," and is a by-product in the manufacture of phosphoric acid om phosphate rock. This material is light and fluffy, and does ot noticeably scorch foliage, even of tobacco; when applied to beans t 30 lb. per acre, 100 per cent. control of the Mexican bean beetle *Epilachna corrupta*, Muls.] under cages was obtained in 24 hours, the ean temperature being 82-84° F.; at 5 lb. per acre it was not effective.

Diabrotica vittata, F. (cucumber beetle), which cleans its feet by rawing them through its mouth, was satisfactorily controlled by a ght application of ordinary sodium fluosilicate, but this material hould be diluted with 3 parts of hydrated lime to avoid foliage injury; extra light " sodium fluosilicate and calcium fluosilicate compound lso gave satisfactory control against this insect. *Protoparce quinemaculata*, Haw. (tobacco hornworm) was controlled by dusting ith " extra light " sodium fluosilicate, calcium fluosilicate compound, arium fluosilicate, natural and artificial cryolite [*R.A.E.*, A, xiii, 76], and aluminium fluosilicate, but the first-named substance caused me foliage injury. *Phyllotreta sinuata*, Steph. (sinuate-striped fleaeetle), a pest of turnips, was controlled by sodium fluosilicate, and *pitrix cucumeris*, Harr. (potato flea-beetle) was satisfactorily conolled by sodium fluosilicate and lime (1 : 4); " extra light " sodium uosilicate has also been used successfully against *E. cucumeris* in laine. Larvae of *Alabama argillacea*, Hb. (cotton worm) were killed 7 hours by sodium fluosilicate, in cages, while calcium arsenate as not effective for 24 hours or more, and calcium fluosilicate comound had no effect. In laboratory experiments with poisoned bran aits, in which sodium or calcium fluosilicate, 1 part to 10 or 20 parts f bran, was substituted for an arsenical, cutworms and *Melanoplus mur-rubrum*, DeG. (red-legged grasshopper) were killed in 7-24 hours. nts and the cockroaches, *Blattella germanica*, L., can be controlled by prinkling sodium fluosilicate in places they frequent. The prorietary solution " Larvex " for use against clothes moths contains, s its toxic principle, about 1 oz. of sodium fluosilicate per gallon. arvae of *Tinea pellionella*, L. (case-making clothes moth) were killed ithin 6 hours by being allowed to feed on raw wool that had been ipped in a $\frac{1}{2}$ per cent. solution of sodium fluosilicate.

Sodium fluosilicate is not suitable for mixing with lime-sulphur olution, as it precipitates the sulphur; it produces a slight reaction ith Bordeaux mixture, but their properties are not destroyed. alcium fluosilicate mixes satisfactorily with lime-sulphur solution or ordeaux mixture. A $\frac{1}{2}$ per cent. solution of sodium fluosilicate id not injure beans, peaches, or apples out of doors, and killed adults f *Epilachna corrupta* in from 10 to 72 hours; it was satisfactory at

2 lb. to 50 U.S. gals. of water against this pest and with the addition of 2 lb. lime against the Colorado potato beetle [*Leptinotarsa decemlineata*, Say], although calcium fluosilicate, 1 lb. to 50 U.S. gals. of water was not effective against the latter. The results of dusting *L. decemlineata* with a number of fluosilicates and allied compounds are given; they all gave good or fair control.

As the larvae of *Epilachna corrupta* feed from the lower surface of the leaves, it has been recommended that dusting and spraying should be directed to this surface. Satisfactory results were, however, obtained in cage experiments with adults by dusting the upper surface of the leaves only. It is suggested that this is logical, since the beetles not only walk about on the upper surface of the leaves, but also eat it, although from beneath.

During the exceptionally hot and dry summer of 1925 in Tennessee *E. corrupta* became very scarce; many adults survived up to the end of July, and large numbers of eggs were laid, but the larvae nearly all dried up immediately after hatching.

The recommendations for dusting for the control of *E. corrupta* are as follows: sodium fluosilicate (commercial) and hydrated lime (1 : 2), 20 lb. per acre, or calcium fluosilicate compound, 30 lb. per acre, or sodium fluosilicate (extra light), 15 lb. per acre; it is advisable that these dusts should be applied to the lower surface of the leaves if egg-laying has begun or larvae are present.

MARCOVITCH (S.) & ROBERT (S. A.). **The Corn Ear Worm on Tomato.**—*Tennessee Agric. Expt. Sta.*, Bull. 133, 14 pp., 14 figs., 11 refs. Knoxville, Tenn., December 1925. [Recd. April 1926.]

The corn ear worm [*Heliothis obsoleta*, F.] is the most important pest of tomatos in Tennessee. The planting of maize with tomatos as a trap-crop for this moth has long been recommended, but there are very few data relating to the degree of protection afforded by this method. In 1923-25 experiments were carried out to determine the value of various methods of interplanting maize with tomatos, and also of spraying with 1 lb. lead arsenate and ½ lb. calcium caseinate in 50 U.S. gals. water. The first year's experiments were inconclusive, but in 1924 and 1925 the plots of tomatos in which maize was interplanted were considerably more heavily infested by *H. obsoleta* than the controls. In 1924 the average number of damaged tomatos in a row was 5·8 on the plots that were sprayed three times (9th May, 3rd and 13th June) 19 on the check plot and 66 on the plot with maize and tomatos alternately in the rows.

The life-history and stages of *H. obsoleta* are described. The eggs are laid chiefly on the leaves, and the larvae begin to feed on them, and may continue to do so until full-grown; frequently, however, in wandering from leaf to leaf they come upon the fruit, which they enter mainly through the calyces. The calyx retains more poison after spraying than the fruit, and it was found in laboratory tests that the larvae could be killed if lead arsenate was placed on it alone. Food-plants of *H. obsoleta* other than maize and tomato include cotton and numerous leguminous and cucurbitaceous plants.

The first spray should be applied about the middle of May, soon after the fruit begins to set, and two or three more applications should be made at intervals of 12-14 days. Dusting with calcium arsenate 10 lb. per acre may be substituted for spraying.

Entomology.—*38th Ann. Rept. Texas Agric. Expt. Sta. 19*[24-]*25*, pp. 19-24. College Station, Texas, 1925. [Recd. April 1926.]

In investigating the causes of the production of winged forms in the cotton aphis [*Aphis gossypii*, Glov.] it was found that, although starvation is an important factor, it is not the only one. Temperature and the age of the plants do not appear to be factors, nor is there any tendency for winged forms to appear in alternate generations. During the last year winged forms appeared in numbers whenever the Aphids were crowded, and in these circumstances 50 per cent. would often be winged.

Cotton boll weevils [*Anthonomus grandis*, Boh.] that emerged from hibernation in the spring were observed in connection with the ingestion of poison. The insects never groom themselves with their rostrum, but use their legs for the purpose. When a weevil moves about on glass or leaves that have been dusted with poison, the tip of its rostrum quickly becomes covered with dust, and particles of dust may be picked up by the mandibles, which work continually ; even if it is well fed paralysis and death occur in 3-8 hours. In cages where entire plants were dusted, 25 per cent. of the weevils were killed in 24 hours, and 88 per cent. in 5 days. In cages in which the squares and bolls were enclosed in paper bags before the plants were dusted, 13 and 52 per cent. of the weevils were killed in 1 and 5 days, respectively.

A study of *Psallus seriatus*, Reut. (cotton hopper) has shown that both nymphs and adults, but particularly the former, injure the terminal buds of cotton plants ; it is concluded that this insect is an important factor in producing blasting of minute cotton squares. The eggs have been found in the young growth of cotton, *Croton*, and *Monarda* (horse-mint) ; the nymphs from the last-named plant were more injurious to cotton than were those from *Croton*. Eggs have been found in cotton stalks that had been ploughed in during the winter and brought to the surface again in the spring. *Croton* plants that are allowed to grow in the late summer and autumn contain many eggs, and are very likely to serve as a source of infestation for cotton planted in weedy fields in the spring. The hibernating eggs hatch from the beginning of April to the middle of May, the first adults appearing on 21st April. There are 5 instars, each lasting 1-2 days in the summer, the adult stage being reached in 7-10 days after hatching, but in the autumn complete development may take 5-6 weeks. The eggs are laid singly, the greatest number observed to be laid by a single female being 11 in 24 hours and 34 in all. During the spring and summer the eggs hatch in 6 to 11 days, the average being 7-8 days. The generations overlap and are not distinct. A number of dusts and sprays were tested against the nymphs and adults, the most successful being sulphur-naphthalene dust, which killed 92 per cent. of the immature stages, and fine sulphur, which killed 85 per cent. None of the dusts killed the adults.

The ant, *Solenopsis geminata*, F., which is found in various field crops in the spring and summer, sometimes migrates to *Citrus* in the autumn when the fields are cleaned and harrowed. Shallow nests are made at the bases of the trees and are sometimes carried up the trunks ; occasionally they are made where the branching begins. The ants injure the trees by cutting the bark under cover of the nests and feeding on the sap. Calcium cyanide " B " dust [*R.A.E.*, A, xiv, 74] applied to the nests with bellows while the ants were disturbed gave complete control. Creosote bands were also safe and effective.

DIBBLE (C. B.). **A Green Measuring Worm which defoliates Hemlock, Balsam, and to a lesser degree, other Forest Trees.**—*Qtrly. Bull. Michigan Agric. Expt. Sta.*, viii, no. 3, pp. 145-148, 2 figs. East Lansing, Mich., February 1926.

During the summers of 1924 and 1925 the larvae of the Geometrid, *Ellopia fiscellaria*, Guen., occurred in unusual abundance in Michigan causing serious injury to various forest trees. When severe, the defoliation may kill the trees. Pupation occurs about the end of August under bark scales or in some sheltered place on the ground, and this stage lasts 10 days. The eggs are laid singly beneath bark scales or in protected places on coniferous foliage. They hatch in the following summer. Infestation is most severe in pure stands, so that particularly those of the preferred food-plants, hemlock [*Tsuga*] and balsam [*Abies balsamea*], should be avoided. Where the expense is justified, spraying with 2 lb. lead arsenate powder to 100 U. S. gals. water or dusting with 10 lb. lead arsenate to 100 lb. hydrated lime is recommended.

HERRICK (G. W.). **Some long-standing and some more recent Insect Pests with Hints on Methods of Control.**—*Proc. 71st Ann. Meeting N. Y. State Hortic. Soc.*, pp. 4-17. Rochester, N. Y., 1926.

The plum curculio [*Contrachelus nenuphar*, Hbst.] was much in evidence during 1925 on plums, cherries and apples. It is generally worst in orchards where there are favourable places for hibernation, and the destruction of these is one of the chief means of control, supplemented, when necessary, by spraying with lead arsenate.

The pear midge [*Contarinia pyrivora*, Riley] has become increasingly injurious during the last 4 or 5 years. It may be checked by picking and destroying all infested fruit before 15th May. In New Jersey applications of kainit at the rate of 1,000-2,000 lb. per acre destroyed the larvae in sandy soil. On heavy clay soils these applications injure the trees, and in these cases shallow cultivation during late June and July will destroy the larvae and pupae.

The carrot rust fly [*Psila rosae*, F.] infests carrots and parsnips in the ground or in storage, provided that the temperature is above freezing. There are two generations a year, the larvae of the first appearing in June and those of the second in late August and the first half of September. In the case of celery the small roots are eaten off, but the plants may sometimes recover. No satisfactory method of controlling this pest has yet been devised.

The cutworms, *Agrotis ypsilon*, Rott., and *Euxoa messoria*, Harr., attacking lettuce, were controlled with a bait consisting of 20 lb. bran, 1½ lb. lead arsenate or 1 lb. Paris green, 2 or 3 lemons, 2 U. S. qts. molasses and sufficient water to make a soft but not sloppy mixture. For normal infestations this should be sufficient for 2 acres. The Notodontid, *Symmerista albifrons*, S. & A. (red-humped oak caterpillar) has suddenly become exceedingly abundant on red oak [*Quercus rubra*] and maple trees in certain localities of New York.

The area infested by the European corn borer [*Pyrausta nubilalis*, Hb.] is rapidly extending. Apparently it only attacks celery in areas where it is two-brooded, and in this case the eggs may be laid on these plants and the ensuing larvae will feed on them.

Sodium fluosilicate has proved effective against the striped cucumber beetle [*Diabrotica vittata*, Say], as it both kills and repels the beetles.

Excellent results were obtained on melons with a mixture consisting of 1 part sodium fluosilicate to 9 parts of lime applied at the rate of 30-35 lb. per acre at intervals of about one week beginning 20th June. From 4 to 5 applications were made. The beetles are also prevented from laying their eggs in the soil near the roots.

According to P. J. Parrott, the situation with regard to San José scale [*Aspidiotus perniciosus*, Comst.] is more favourable than it has been for many years. The treatment recommended is lime-sulphur 1 : 8, but in badly infested orchards where this is not sufficient, lubricating oil emulsion containing 2-3 per cent. oil or commercial miscible oil should be tried.

According to E. P. Felt, *Hemerophila pariana*, Clerck (apple and thorn skeletoniser) is apparently becoming of less serious importance owing to the activities of natural enemies and unfavourable climatic conditions.

The usual methods of controlling the cabbage maggot [*Phorbia brassicae*, Bch.] with cheesecloth screens, mercury bichloride and tobacco dust are dealt with by H. Glasgow.

PARROTT (P. J.). **The Peach Cottony Scale.**—*Proc. 71st Ann. Meeting N. Y. State Hortic. Soc.*, pp. 23-29. Rochester, N. Y., 1926.

A home-made lubricating oil emulsion containing 3-4 per cent. oil is an efficient spray for the control of the peach cottony scale [*Pulvinaria amygdali*, Ckll.] The methods of preparing it are described. Various proprietary brands of miscible oil are also satisfactory. The sprays should be applied when the buds begin to swell and before the bud scales separate, exposing the green tissues at the end. Spraying should not be done before or after this period.

THATCHER (R. W.). **Sources of Nicotine for Insecticide Use.**—*Proc. 71st Ann. Meeting N. Y. State Hortic. Soc.*, pp. 30-37. Rochester, N. Y., 1926.

Experiments with a view to growing tobacco for insecticidal purposes are briefly discussed. It seems probable that a crop of tobacco can be grown that will contain 4 or 5 per cent. nicotine in its leaves, and this will be more efficient for insecticides than commercial 1 per cent. nicotine tobacco dust. The best method of harvesting and drying the crop in order to preserve the high nicotine content still require to be worked out.

Several selected strains of both *Nicotiana rustica* and *N. tabacum* are being propagated with a view to producing a still higher nicotine content.

WILLSON (R. B.). **A Possible Effect on Fruit Growing by extensive Use of Arsenical Dusts in Orchard.**—*Proc. 71st Ann. Meeting N. Y. State Hortic. Soc.*, pp. 38-42. Rochester, N.Y., 1926.

Attention is drawn to the large number of honeybees destroyed in New York as a result of arsenical poisoning. The application of dust has far more serious effects than spraying, and as the poison also affects other pollinating insects, the ultimate fruit crop is likely to be considerably affected.

Parrott (P. J.). **Controlling Fruit Flies in Cherry Orchards. Summary.** —*Proc. 71st Ann. Meeting N. Y. State Hortic. Soc.*, pp. 130-131. Rochester, N.Y., 1926.

The most economical and efficient method of controlling cherry fruit-flies [*Rhagoletis* spp.] is spraying with lime-sulphur or Bordeaux mixture containing lead arsenate. Two applications are generally sufficient, the first when the flies appear and the second about a week or ten days later. Heavy applications of a dust of sulphur and lead arsenate (90-10 formula) are equally efficient. As the dust does not adhere so well as the spray, more treatments should be given and at shorter intervals. Supplementary remedial measures are early picking and the clearing away of all crop remnants. Hibernating individuals may be destroyed by frequent shallow cultivation from the time the cherries begin to colour until midsummer.

Mundinger (F. G.). **Some Insect Pests of the Hudson Valley.**—*Proc. 71st Ann. Meeting N. Y. State Hortic. Soc.*, pp. 142-144. Rochester, N.Y., 1926.

An unusual outbreak of red spider [*Tetranychus*] occurred on fruit trees. The early spring sprays of home-made and miscible oils were more effective against the eggs than lime-sulphur, but for summer applications oil sprays and lime-sulphur, 1-40, both gave promising results. It is possible that the lime-sulphur may be even more reduced. It is essential that leaves and twigs be thoroughly wetted.

Against the pear psylla [*Psylla pyricola*, Först.] a number of sprays, including various combinations of oil and nicotine, have been tried, most of which gave promising results. The efficacy of dusts of lime and nicotine or calcium cyanide was increased by the addition of plaster of Paris. Almost all the adults and older nymphs were killed by the application of 10 lb. plaster of Paris, 40 lb. lime (hydrate) and 1 U.S. pint nicotine sulphate, or 10 lb. plaster of Paris, 10 lb. calcium cyanide " B " [*R.A.E.*, A, xiv, 74] and 30 lb. lime.

Felt (E. P.). **Factors affecting Insect Control.**—*Proc. 71st Ann. Meeting N. Y. State Hortic. Soc.*, pp. 150-154. Rochester, N. Y., 1926.

A general account is given of the various factors to be taken into consideration when attempting insect control.

Schoene (W. J.) & Willey (C. R.). **The Bean Beetle in Virginia.**—*Qtrly. Bull. Virginia State Crop Pest Commiss.*, vii, no. 2, 4 pp., 2 figs. Blacksburg, Va., July 1925. [Recd. May 1926.]

An account is given of *Epilachna corrupta*, Muls. (Mexican bean beetle) and its importance in Virginia. The measures recommended are handpicking and dusting with arsenicals [*R.A.E.*, A, xiii, 329]. Calcium arsenate $\frac{3}{4}$ lb., hydrated lime $1\frac{1}{2}$ lb. and water 50 U.S. gals. may be used as a spray, but all traces of poison must be washed off the beans before using them for food.

CAMPBELL (F. L.). **On the Rôle of Calcium Hydroxide in Hydrated Lime-Acid Lead Arsenate Sprays.**—*Jl. Agric. Res.*, xxxii, no. 1, pp. 77–82, 11 refs. Washington, D.C., 1st January 1926. [Recd. April 1926.]

Hydrated lime has been successfully used to reduce or eliminate injury to tender foliage caused by acid lead arsenate ($PbHAsO_4$), though at least two cases of severe injury have occurred in New Jersey. This paper is the result of an attempt to determine what conditions would make possible such unusual foliage injury [*cf. R.A.E.*, A, xiv, 145]. The chemical reactions in vitro of the combination spray are considered and its possible effect on foliage is discussed, the results being summarised by the author as follows: The following series of reactions probably occur in combination calcium hydroxide and acid lead arsenate sprays :—

(1) In spray tank and on foliage while there is an excess of calcium hydroxide: $5PbHAsO_4+3Ca(OH)_2=Pb_4(PbOH)(AsO_4)_3+Ca_3(AsO_4)_2+5H_2O$.

(2) On foliage: $Ca(OH)_2+CO_2=CaCO_3+H_2O$.

(3) On foliage: $Ca_3(AsO_4)_2+CO_2+H_2O=2CaHAsO_4+CaCO_3$.

The usual protective effect on foliage of calcium hydroxide in acid lead arsenate combination sprays may lie in the fact that soluble calcium arsenate from such sprays is less toxic to foliage than soluble arsenic acid from sprays of acid lead arsenate alone. Apparently under warm and humid conditions, however, such as often occur in New Jersey, acid calcium arsenate (equation 3) may become present on foliage sprayed with $Ca(OH)_2+PbHAsO_4$ in high enough concentration and over a sufficient period of time to cause severe foliage injury.

HILL (C. C.). U.S. Bur. Ent. *Platygaster hiemalis* **Forbes, a Parasite of the Hessian Fly.**—*Jl. Agric. Res.*, xxxii, no. 3, pp. 261–275, 6 figs., 12 refs. Washington, D.C., 1st February 1926. [Recd. April 1926.]

Platygaster hiemalis, Forbes, is the most important parasite of *Mayetiola* (*Phytophaga*) *destructor*, Say (Hessian fly) in the Middle Atlantic States; it has been found in most wheat-growing regions of the United States where its host occurs, including Washington and Oregon. It was introduced into Washington and California, but failed to become established in the latter State. The percentage of the autumn generation of *M. destructor* parasitised by it, based on data obtained from numerous localities from Pennsylvania to Virginia, during nine years, averaged 28. *P. vernalis*, Myers [*R.A.E.*, A, xi, 562] parasitises about 4 per cent. fewer of the spring generation; moreover, *P. hiemalis* is the only important parasite of the autumn generation.

The life-history, stages and development of *P. hiemalis* are fully described and illustrated [*R.A.E.*, A, x, 423], and the adult is described by P. R. Myers. When provided with nourishment, the average length of life of the adults was 12 days for females and 10 days for males. Parthenogenesis occurs, and a female may deposit both fertilised and unfertilised eggs at a single oviposition, with the result that both sexes develop from the same host. The ratio of females to males is about 2 : 1. The eggs develop both monembryonically and polyembryonically [*R.A.E.*, A, xii, 15]. The greates number of ovipositions by an individual in confinement was 160 at the rate of 4·22 eggs per oviposition (a low estimate) this woul mean 675 eggs, and each egg produces, on the average, 1·5 adults Dissection of the ovaries of 10 females showed an average of 3,322 eggs

In the spring-wheat region of northern New York the life-histor is greatly modified ; many adults emerge in the spring and are thu able to take advantage of the principal egg-laying period of *M destructor* in that region.

Ries (D. T.). **A Biological Study of** *Cephus pygmaeus* **(Linnaeus) the Wheat-stem Sawfly.**—*Jl. Agric. Res.*, xxxii, no. 3, pp. 277–295 10 figs., 14 refs. Washington, D.C., 1st February 1926.

Cephus pygmaeus, L. (wheat-stem sawfly) was introduced int New York State some time before 1887, when it was plentiful nea Ithaca ; in the same year it was taken in Canada, near Ottawa. I spread very slowly in New York, and passed almost unnoticed unti 1921, since when it has greatly increased both in New York an Pennsylvania.

All stages are described and illustrated ; a key, by P. R. Myers to the adults of *C. pygmaeus*, *C. cinctus*, Nort., and *Trachelus tabidus* F., is given ; and Gahan's key to the larvae of these three specie [*R.A.E.*, A, viii, 347] is reproduced.

The most important food-plant of *C. pygmaeus* is wheat, but it als occurs in rye, barley, and *Bromus secalinus* (chess). Infestation o wheat varies greatly with the locality and may occasionally be a high as 60 or 70 per cent. The loss caused by the severance of the wheat straws is very small, as most farmers rake the fields after cutting them. The loss in weight of grain has not been satisfactorily determined. It appears that eggs are usually laid in the largest wheat stems, and this accounts for the fact that the weight of grain from infested stems often exceeds that from non-infested stems.

The adults emerge at Ithaca at the beginning of June and are present for about three weeks ; they commonly frequent yellow flowers especially those of mustard, where mating takes place. Each female lays about fifty eggs, not more than one being placed in a single stem by one female, usually between the third and fourth nodes. The larva hatches in 7–10 days and feeds inside the stem, which it apparently traverses several times. After about a month, it descends finally to the base, where it makes a plug of frass ; below this it cuts a V-shaped groove round the interior of the stem, about ½–1 inch above the ground ; below the groove it makes another plug, and below this spins a cocoon in which it hibernates, pupating about a week before emergence in the following spring. The stem, kept firm by the two plugs, readily breaks off at the groove between them, leaving a characteristic jagged-edged stubble, and the adult emerges through the lower plug.

The parasites of *C. pygmaeus* reared by the author included : *Eupelmus allyni*, French, *Eupelminus saltator*, Lind., *Pleurotropis benefica*, Gah., and *Heterospilus cephi*, Rohw. *Collyria calcitrator*, Grav., and *Arthrolysis scabricula*, Nees, have been recorded as parasites in Europe.

Campbell (F. L.). **The Practicability of Quantitative Toxicological Investigations on Mandibulate Insects.**—*Jl. Agric. Res.*, xxxii, no. 4, pp. 359–366, 2 figs., 13 refs. Washington, D.C., 15th February 1926.

The effects of stomach-poison insecticides have not yet received attention from a deliberately quantitative point of view. In this paper methods developed for administering poison solutions to mandibulate insects are described, and the results obtained in experiments on *Malacosoma americanum* (tent caterpillar) and *Datana ministra* (yellow-necked caterpillar) are given.

The author's summary of the paper is as follows: The ability of certain mandibulate insects to imbibe completely drops of poison solutions has been utilised as a basis for the development of methods for the quantitative toxicological examination of soluble arsenical stomach-poison insecticides. By the use of these methods, it has been found that trivalent arsenic is more toxic than pentavalent arsenic, that different species vary in susceptibility to arsenic poisoning, and that the minimum lethal dose of arsenic for the two moths studied is about 0·02 mg. of arsenic per gram of insect.

Allen (H. W.). **Life History of the Variegated Cutworm Tachina Fly,** *Archytas analis*.—*Jl. Agric Res.*, xxxii, no. 5, pp. 417–435, 1 pl., 6 figs., 22 refs. Washington, D.C., 1st March 1926.

The larval and adult stages of *Archytas analis*, F., are described, together with the life-history as observed in Mississippi. This Tachinid is generally distributed throughout the United States, except the extreme south-west, and occurs also in south-eastern Canada, the West Indies, Colombia, and Venezuela. Its recorded hosts are all Lepidopterous larvae, the most important being *Lycophotia margaritosa*, Haw. (variegated cutworm), of which 22 per cent. were parasitised in 1925. It has been recorded from several localities as a parasite of *Cirphis unipuncta*, Haw. (army worm), but in Mississippi infestation of this host was negligible in 1924 and 1925. Other natural hosts are *C. latiuscula*, H. & S., *C. multilinea*, Wlk., *C. juncicola*, Guen., *Malacosoma californica*, Pack., *M. fragilis*, St., and *Laphygma frugiperda*, Guen. (fall army worm). Experimentally it has been reared very satisfactorily in larvae of *Prodenia ornithogalli*, Guen. (yellow-striped army worm), but it has not been found parasitising this moth in nature.

Mating of *A. analis* takes place almost immediately after the emergence of the females and is followed by a pre-larvipositional period averaging about 11 days. The larvae are laid on the plants frequented by the host larvae, chiefly on the stems, each one having its posterior end in a minute cup-like membrane attached to the plant. The larvae lie closely pressed to the plant surface until the latter is disturbed, when they rear upwards in search of a host; if no host is available they may live more than a month in cool weather or half that time in the summer, and very few live less than 8 days. A number of larvae deposited in the late autumn survived the short, mild winter on plants, and a few lived for 52 days, but it is very doubtful if hibernation in this stage is ever successful, as all the larvae died before any host became available. When a larva succeeds in attaching itself to a host, it crawls to a protected place where it again becomes quiescent.

It then bores obliquely through the integument and lies between it and the hypodermal layer for several days, after which it penetrates into the body cavity, in which it remains until the host pupates, when it moults for the first time. The second instar larva occurs in a wing-pad of the host pupa, with its spiracles applied to a rupture at the end of the wing-pad; its development is rapid, and the host pupa is killed at the end of the second or beginning of the third instar of the parasite. The third instar larva feeds on the decaying tissues of the host and occupies most of the pupa case, its anal spiracles being applied to a rupture at the anterior end. The larva pupates inside the host pupa with its anterior end at the anterior end of the latter, and the adult emerges about 11 days later. Only one larva is able to complete its development in a single host. The length of the larval period in the host varies according to the instar in which the latter is attacked, being about 9 days if it is in the last instar, 11 if in the last but one, and 15 if in the last but two. The young larvae, while on the plants on which they are laid, possess some power of differentiation between possible hosts, as they will not attach themselves to certain Lepidopterous larvae; on the other hand, they will readily attach themselves to some others, in which they are apparently unable to develop.

The adults visit flowers, especially of herbaceous plants in fields, such as *Melilotus*, and feed on the nectar; they also feed occasionally on honey-dew. Segregation of the sexes is of common occurrence in the field, and groups of either sex may be found; the adults are active under wide extremes of temperature and may live as long as 50 days, the average length of life being 22 days. They are strong fliers, and it is thought that the females may migrate. The average duration of the larviposition period is 13 days, but larvae are not deposited each day; they may be deposited at the rate of 10 or 12 per minute. The average number of larvae produced by each female in the insectary was 270, the largest 579; a dissected female contained 890 larvae and eggs.

The length of the life-cycle varies from 25 days to 118 days, or probably longer in the winter. There are two complete and several partial broods a year, but they overlap extensively. The manner in which hibernation occurs is not definitely known.

A. analis should offer considerable opportunities for biological control. Free-living larvae on stems of *Melilotus*, the bases of which were wrapped in damp sphagnum, were successfully sent by post on a journey occupying 5 days, in hot weather. They did not survive cold storage for 30 days.

LOMANITZ (S.). **An Alternate Extraction and Exposure Method used in Connection with Study of Arsenicals.**—*Jl. Agric. Res.*, xxxii, no. 5, pp. 499–500. Washington, D.C., 1st March 1926.

In the ordinary method for the determination of the amount of water-soluble arsenic present in an insecticide the powder to be tested is placed in water for a certain time and then filtered, and the filtrate is tested. The author has found that by allowing the insoluble residue on the filter-paper to dry, exposing it to the atmosphere, and then repeating the process for the determination of water-soluble arsenic, the amount of the latter is found to be very much more, especially if the process is repeated several times, than is found after exposing the powder to water continuously for the same time. By this method, which approximates more closely to the actual conditions obtaining in the field than the ordinary one, mixtures considered on the basis of a single extraction to be harmless have been found to contain enough water-soluble arsenic to make foliage injury from their use almost inevitable. It is suggested that to obtain conditions as nearly as possible resembling field conditions the amount of water used in extractions after the first should be determined by the ratio of dew to arsenical precipitate on leaves following spraying or dusting.

In a mixture of lime, sulphur and lead arsenate, it is apparent that an atmospheric agent, probably carbon dioxide, acting upon the lime in the mixture, increases the proportion of water-soluble arsenic. A mixture of sulphur and lead arsenate, in the usual proportions, to to which was added calcium carbonate instead of hydrated lime, showed about 7 per cent. of water-soluble arsenic from the beginning, being almost the percentage obtained by five extractions by the alternate extraction and exposure method with lime, sulphur, and lead arsenate.

The change of properties in arsenical mixtures due to wetting and drying may bear some relation to such qualities as adhesiveness and spreading.

COLLINS (C. W.). U.S. Bur. Ent. **Observations on a Recurring Outbreak of** *Heterocampa guttivitta* **Walker and Natural Enemies Controlling it.**—*Jl. Agric. Res.*, xxxii, no. 7, pp. 689–699, 8 refs. Washington, D.C., 1st April 1926.

The distribution and life-history of *Heterocampa guttivitta*, Wlk., are briefly described. The eggs are laid singly on the leaves of beech, maple and other hardwoods and hatch in about 9 days. The larval stage lasts about 5 weeks. Pupation occurs in leaf mould or beneath the ground from the middle of July or August, and hibernation occurs in this stage.

From an examination of infested territory in Massachusetts and New Hampshire, where beech, sugar maple [*Acer saccharum*], and other hardwoods abound, it is thought that if conditions prevail similar to those governing the 1917–1920 outbreak and the period preceding it, infestation may be expected again in 1928–1930.

A list of 25 predators and parasites of this moth is given. The reduction of the 1917–1920 outbreak was largely due to disease and starvation among the larvae and to the attacks of *Calosoma frigidum*, Kirby, the egg parasite, *Telenomus coelodasidis*, Ashm., and several Hymenopterous and Dipterous parasites of the larvae and pupae.

WEDGWORTH (H. H.) & ANDERS (C. B.). **Poisoned Bait for the Control of Cutworms.**—*Mississippi Agric. Expt. Sta.*, Circ. 62, 3 pp. A. & M. College, Miss., December 1925. [Recd. May 1926.]

Feltia ducens (dingy cutworm) has been doing considerable damage to tomato plants in the field in Mississippi. Experiments with a bait of 5 lb. wheat shorts, 1½ oz. Paris green, ½ U.S. pt. molasses and 1 U.S. gal. water, are described. In cages in which there was no vegetation 88 per cent. of the cutworms were killed where the bait was broadcast. In cages with tomato plants 7 per cent. of the plants were injured as compared with 96·88 per cent. in the untreated cages. In a simple field test the bait was applied in small quantities near each plant. Less than 0·1 per cent. of the plants were cut as compared with 23·65 per cent. in the untreated rows.

In other investigations wheat bran was as effective as wheat shorts.

GRANOVSKY (A. A.). **The Efficiency of Sawdust Bait in the Control of Grasshoppers.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 211–218. Geneva, N.Y., April 1926.

During the summer of 1924 a large scale campaign was undertaken against grasshoppers in Wisconsin. The breeding-grounds treated covered an area of over 25,000 acres. The formula for the poison bait was different from that usually recommended and consisted of 100 lb. sawdust, 1 U.S. qt. sodium arsenite, 1 U.S. gal. molasses, 5 lb. salt, and 7–10 U.S. gals. water. It was applied at the rate of 10–20 lb. of wet bait per acre, depending on the grasshopper population. The cost was only about 4d. per acre, and the results exceeded all expectations. Although all necessary preparations were made for two or, if necessary, three annual applications, the infestation was so reduced by the first one that the others were not needed. In 1925 the densest grasshopper population in the treated areas amounted to 3 or 4 to a square yard, but it was usually only 1 or 2 to a square rod, whereas in 1924 it amounted in places to more than 200 to the square foot.

The most abundant species is *Camnula pellucida*, Scud. (clear-winged locust), but the bait proved equally effective against the other species, which, in order of their economic importance, are: *Melanoplus atlantis*, Riley, *M. luridus*, Dodge, *M. femur-rubrum*, DeG., *M. bivittatus*, Scud., *Dissosteira carolina*, L., and *Chortophaga viridifasciata*, DeG. *M. femur-rubrum* was particularly injurious in the tobacco-growing regions of the southern part of the State.

As was expected, the untreated areas adjacent to treated areas received the benefit of increased parasitism. The parasites recorded were the Bombyliid, *Systoechus vulgaris*, Lw., Tachinids and Sarcophagids. In the treated areas the grasshoppers were so heavily infested with red mites, *Trombidium* sp., that many individuals lost their wings. About 65 per cent. of the females and 57 per cent. of males were infested with the Nematode, *Mermis nigrescens*.

In 1924 the bait was applied over the breeding-grounds just before the migration of the grasshoppers to cultivated areas. Several tests made in 1925 show that molasses may be entirely omitted from the bait, thus reducing its cost to about 3d. an acre. It is generally recommended that baits should be applied while fresh, whereas in the present experiments it was found that old fermented bait was of greater value than fresh. In old bait the poison in solution has better penetrated the particles of sawdust and cannot be easily washed out or leached. Even a year-old bait when moistened with a little water proved to be very effective. The best time for application is about 10 a.m., just before the greatest feeding activities, which are between 11 a.m. and 1 p.m. Many grasshoppers are killed by eating other poisoned individuals.

Though all sorts of sawdust were used, 1 or 2 year old sawdust was the best.

According to J. J. Davis sawdust from coniferous trees was found to have a decidedly repellent action in Indiana.

SEVERIN (H. C.). **The Common Black Field Cricket,** *Gryllus assimilis* **(Fab.) and its Control.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 218–227, 2 refs. Geneva, N.Y., April 1926.

This paper is the result of 12 years study of *Gryllus assimilis*, F., in South Dakota, where it is a pest of major importance. Any and all parts of plants may be eaten, a decided preference being shown for the flowers and developing seeds. Lucerne is the favourite food-plant, and an entire crop may be destroyed in 7–10 days. Other food-plants include wheat, oats, barley, etc., and many vegetables. This cricket is also carnivorous.

In South Dakota there is one generation a year. About 5 per cent. of the crickets pass the winter in the nymphal stage, but the great majority do so in the egg stage. Hatching usually begins in the last week of May and continues for 2–4 weeks. The various nymphal instars are described. The adults begin to appear at the end of July and beginning of August. Egg-laying starts within a fortnight after females have become adult and may be continued for 2 months or more. The eggs are laid singly in the soil.

The most important natural enemies are the egg parasite, *Ceratoteleia marlatti*, Ashm., which destroys 20–50 per cent. of the eggs, and the Tachinid, *Sarcophaga kellyi*, Ald.

The most satisfactory remedial measure is the destruction of the eggs. This may be done by any means that will expose them to the air, sun and wind for 3–5 hours. As they are not laid deeper than 1–1½ inches in the soil, any process that will disturb the soil so as to bring the eggs to the surface will serve the purpose. This work should be done in the late autumn and again in the early spring.

The best method of destroying the nymphs and adults is by poison baits. Though more than 50 different mixtures were tried as baits the most efficient in one application only killed 50 per cent. It consisted of 25 lb. bran, 1½ lb. white arsenic (just as satisfactory results being obtained with Paris green or sodium arsenite), 1 U.S. gal. molasses and 3¾ U.S. gals. water. The bait was applied in the late afternoon (most of the feeding occurs between 4 and 9 p.m.) at the rate of 8 lb. per acre. In irrigated lucerne fields it was applied 2 days after irrigation, otherwise after rain had fallen.

Cyanogas calcium cyanide granules (containing 40–50 per cent. calcium cyanide) at the rate of 40 lb. per acre did not kill more than 10 per cent. of the crickets in a lucerne field.

Stacks of old hay or straw and weeds raked into piles and allowed to lie on the ground will attract many crickets.

Borodin (D. N.). **Practice of estimating Losses caused by Insect Pests to the Small Grains in Russia.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 227–235. Geneva, N.Y., April 1926.

The following is taken from the author's abstract of this paper:

The practical need of determining losses caused by insect pests is recognised as an important part of the work of economic entomologists, agronomists and statisticians. Those insect pests that are invisible to a casual observer are probably the most important.

In order to determine the losses caused to certain plants by a given insect, an experiment of artificial infestation, with a future comparison of the control plants and infested plants, must be made. The difference in weight of the yield of normal and infested plants expressed in percentage is called the "coefficient of injury." This is quite constant for certain insect pests. The coefficient of injury caused by a given insect might, and really should, be determined by experiments in a laboratory, and must be done once and for all.

The percentage of infested plants, or stems of plants in the field, is called the "percentage of infestation." Percentage of decrease in the yield, or "percentage of loss" caused by a certain insect pest to a given crop in the field may be determined from the formulae given, as may be also the "actual yield" per acre of a certain field and the "possible (theoretical) yield" from the same field when not infested. The "actual loss" caused by insect pests is the difference between the theoretical and actual yields.

To know the exact cost of feeding a certain insect pest is especially valuable, if determined correctly. The quantitative side of the loss caused by insect pests is tremendous, but as yet unknown to the general public.

Cory (E. N.) & Sanders (P. D.). **Status of the Potato Tuber Moth in Maryland.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 235–239. Geneva, N.Y., April 1926.

Phthorimea operculella, Zell., is a recently established pest in Maryland, and its distribution in this State is discussed. Climatic conditions apparently have a marked effect on infestation, heavy rainfall greatly reducing its increase.

Potatoes left in the field afford protection for the larvae in the winter; whether the moth can survive the winter in any other stage has not been ascertained.

As the eggs are only laid at night, barrels of harvested potatoes should be removed from the field before nightfall. All potatoes badly infested in the spring should be destroyed; to avoid tuber infestation before harvesting, the potatoes should be kept well ridged; adequate ridging is essential if digging cannot be done before the vines are dying; mechanical diggers should be used; the fields should be cleaned up after each harvest; and for dusting or spraying, arsenicals or a combination of these with Bordeaux should be applied.

Eddy (C. O.). **The Mexican Bean Beetle in South Carolina.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 239–247, 3 figs. Geneva, N.Y., April 1926.

The seasonal history of *Epilachna corrupta*, Muls. (Mexican bean beetle) in South Carolina in 1925 is discussed. In this year its activities were limited by extreme drought. The majority of the hibernating adults appeared and oviposited between the middle of May and middle of June. The adults of the first summer generation occurred from June to October, very few, if any, hibernating. The next generation adults began to be numerous in August and most of them hibernated; they were ovipositing from 14th August to 4th October. The adults of the next generation occurred in September and October, and most of them hibernated without ovipositing, though there was a very small fourth generation.

During 1924 *E. corrupta* was observed on many plants other than beans, but in 1925 during the spring and summer it only attacked various bean plants, though in the autumn it was found on cowpeas. The Coccinellid, *Megilla maculata*, DeG., destroyed many eggs, while numbers of larvae were killed by what appeared to be a bacterial disease, which occurred chiefly during August, the driest period.

DOUCETTE (C. F.). U.S. Bur. Ent. **The Effect on Narcissus Bulb Pests of Immersion in Hot Water.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 248–251. Geneva, N.Y., April 1926.

Experiments were made to test the efficacy of the generally adopted method of treating bulbs by immersion in hot water in order to destroy pests. The standard method against *Tylenchus dipsaci*, Kühn, in narcissus bulbs is immersion for 3 hours in water at a temperature between 110° and 112° F. This proved entirely satisfactory against the larvae of *Merodon equestris*, F. (narcissus fly) and *Eumerus strigatus*, Fall. (lesser bulb fly), and against all stages except the eggs of *Rhizoglyphus hyacinthi*, Boisd. (bulb mite). It was not tried against the eggs.

Temperatures of 100° F. do not give complete mortality in 3 hours, but at 105° F. 2 hours are sufficient. Complete mortality occurred in all immersions of 40 minutes and over at 110° F. Temperatures above this require only 30 minutes for complete control.

Bulbs with roots 2–3 inches long were immersed for 3 hours at a temperature of 110° F. and were then wrapped in moist cheesecloth until planted 4 days later. Some of the roots had pushed through the cheesecloth, and the bulbs had not apparently suffered. This contradicts the theory that treatment after the roots have started to grow is detrimental to the root tips.

SHELFORD (V. E.). **Methods for the Experimental Study of the Relations of Insects to Weather.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 251–260, 3 charts, 4 refs. Geneva, N.Y., April 1926.

The purpose of studies of relations of this kind is to predict the time of appearance of the different stages and thus to regulate spraying or to predict the abundance of a pest or its enemies. For this both field observations and experiments are essential, but the old methods of phenology, etc., are inadequate.

The author's abstract of this paper is as follows: The summing of temperatures is abandoned, and degree-hour developmental units are substituted for effective degrees. The variation in the character of stocks to be used is such that a full series of about 60 experimental combinations of temperature and humidity should be applied to the same generation when relative effects of the various combinations are desired. Continuous quantitative collections circulated with weather records will throw light upon weather effects. The founding of a well endowed laboratory for such work is suggested.

HERMS (W. B.). **An Analysis of some of California's major Entomological Problems.**—*Jl. Econ Ent.*, xix, no. 2, pp. 262–270, 6 refs. Geneva, N.Y., April 1926.

The losses to fruit, field and vegetable crops due to insect pests in California in 1924 is estimated at over £5,600,000, while the cost of insect control as related to the same crops is estimated at about £2,300,000. The more important problems are briefly discussed, recent advances in knowledge are reviewed, and suggestions are made for future study and improvement.

HOWARD (L. O.). **The Parasite Element of Natural Control of Injurious Insects and its Control by Man.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 271–282. Geneva, N.Y., April 1926.

The following is the author's abstract of this paper: The paper summarises the work in introducing parasites, points out some of the mistakes that have been made, and generalises as to the principles involved in work of this kind. It has something to say about the expense involved in much of the previous work in this direction, showing that where there has been actual waste it has been due to ignorance or incompetence. Only the best trained experts should be allowed to take part in investigations leading up to international exchanges. In case of serious loss from introduced pests, studies of the parasites in their native home should be begun at once, and no expenditure consistent with rigidly scientific methods should be begrudged.

SHELFORD (V. E.). **The Relation of Abundance of Parasites to Weather Conditions.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 283–289, 2 figs., 7 refs. Geneva, N.Y., April 1926.

If sufficient numbers of individuals of one or several host species are available, the abundance of a parasite is controlled primarily by survival during adverse periods of inactivity, rate and duration of development of new generations, and activities controlling fertilisation, oviposition, migration from host to host, etc. The purpose of this paper is to indicate some of the general types of methods that will probably prove helpful in the investigation of the question.

The author's abstract is as follows: Parasites are governed by the same laws as other insects. Abundance is influenced by weather, but no definite general rules as to relative effect upon the host and the parasite can be laid down. The test of abundance is abundance itself as shown by continuous quantitative collections correlated with complete weather records. Experiments are necessary to indicate which of several correlated factors are controlling each particular case.

BURGESS (A. F.). U.S. Bur. Ent. **The Present Status of the Control of the Gipsy Moth and the Brown-tail Moth by Means of Parasites.**—*Jl. Econ. Ent.*, xix. no. 2, pp. 289-294. Geneva, N.Y., April 1926.

The following is the author's abstract: This paper deals with the results of the introduction of the parasites of *Porthetria dispar* (gipsy moth) and *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*) (brown-tail moth), during the past 20 years, and indicates that this work has been enormously beneficial. Many parasites have apparently reached their maximum, and during the past two years a sharp decrease in parasitism has been noticed. In several sections of the infested area this has been followed by rapid increase in the abundance of the gipsy moth, and just at present the work is passing through a critical stage, with no reliable information as to whether the gipsy moth or its enemies will gain permanent control. An enormous amount of scientific data has been secured, and further efforts are being made to introduce other parasites that attack the gipsy moth.

SMITH (H. S.). **The present Status of Biological Control Work in California.**—*Jl. Econ. Ent.*, xix. no. 2, pp. 294-302, 1 ref. Geneva, N.Y., April 1926.

The following is the author's abstract: Biological control is discussed from two angles; one that of the public attitude toward it; the other, its present condition from the economic standpoint.

Because of the spectacular results of the introduction of *Novius* (*Vedalia*) *cardinalis*, the Australian ladybird, in the early days of California horticulture, the general public was inclined to favour this method of control to the exclusion of all others. This is no longer the case, and while the work is generously supported both by scientific institutions and by growers' organisations, it is properly looked upon as only one arm of the defence against insects injurious to agriculture.

The numerical status of the cottony cushion scale [*Icerya purchasi*] is kept below the danger line in an almost perfect way by the work of *N. cardinalis* and *Cryptochaetum monophlebi*. The contrary is true of the black scale [*Saissetia oleae*] which, although attacked by several parasites and predators, maintains a high level of abundance and is still the most important pest of *Citrus* in the State. The attempt to find effective natural enemies of this pest is being continued. The red scale [*Chrysomphalus aurantii*] has been studied in the Orient during the past 18 months, and new natural enemies have been located there. The control of mealybugs [*Pseudococcus*] by the production and distribution of quantities of the ladybird, *Cryptolaemus montrouzieri*, has been eminently satisfactory, and the costs of this operation have been reduced as compared with those of the preceding season.

CHAMBERLIN (T. R.). U.S. Bur. Ent. **The Introduction and Establishment of the Alfalfa Weevil Parasite,** *Bathyplectes curculionis* **(Thoms.), in the United States.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 302-310, 12 refs. Geneva, N.Y., April 1926.

The geographical distribution and the importation and liberation in Utah of *Bathyplectes curculionis*, Thoms., are discussed. During the first few years following its introduction the spread of the parasite was very slow, but later became more rapid; after about 8 years it was found 230 miles from its original site, and it practically covered the area infested by the alfalfa weevil, *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.). As the extent of parasitism of the larvae varies at different times of year, there is a possible advantage in introducing a many-brooded parasite such as *Tetrastichus incertus*, Ratz.

JONES (D. W.). U.S. Bur. Ent. **Some Notes on the Technic of Handling Parasites.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 311-316. Geneva, N.Y., April 1926.

The author's abstract is as follows: Parasites are so specialised that no two species may be handled in the same way. Knowledge of the reactions, habits, and general life-history of a species must be enlarged and added to step by step. The solution of the problem of handling parasites successfully is obtained only by making use of such favourable points as present themselves and modifying methods in such a way as to take advantage of any new information that study and observation may yield. Proper co-ordination between various steps is necessary.

The handling of two breeding problems is explained to show why and how certain technique was developed, the two species taken as examples being *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., and *Exeristes roborator*, F., both parasites of the corn borer [*Pyrausta nubilalis*, Hb.].

Herms (W. B.). **The Effects of Parasitism on the Host and on the Parasite.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 316-325, 14 refs. Geneva, N.Y., April 1926.

The following is taken from the author's abstract: Parasites are adapted to this mode of life in two general respects, namely, physiologically and morphologically, and these adaptations become the more intense and exclusive as this mode of life progresses.

A true parasite should not destroy its host ; the life of the host and that of the parasite have become closely tuned to each other, and the slightest change in the mode of life of either may result in serious disturbances in the life of the other.

The laws governing the development of a successful parasite are operative in the development of all successful living beings ; it is therefore necessary to study the effects of parasitism on the host and on the parasite from a more comprehensive biological point of view.

Section of Plant Quarantine and Inspection.—*Jl. Econ. Ent.*, xix, no. 2, pp. 326-399. Geneva, N.Y., April 1926.

This series of papers includes : The Legal Aspect of Plant Quarantines, by L. A. Strong ; The Legal Side of Regulatory Work, by G. G. Becker ; The Control of Mosaic of Red Raspberries from the Nursery Inspector's Standpoint, by A. G. Ruggles and J. D. Winter ; Missouri Plant Act of 1925, by L. Haseman ; Desirability of fumigating Dormant Nursery Stock, by E. N. Cory ; The Tourist Problem, by S. B. Fracker ; The Western Plant Quarantine Board, its Purposes and Organisation, by M. L. Dean ; and Report on Activities of the Central States Advisory Plant Board, by P. A. Glenn.

Newton (J. H.). **Status of the Alfalfa Weevil in Colorado.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 371-374, 1 ref. Geneva, N.Y., April 1926.

The following is taken from the author's abstract : Colorado has maintained local quarantines on the movements of hay and straw as a means of retarding the spread of *Hypera variabilis* (*Phytonomus posticus*). The weevil has been present in Colorado for 8 years, during which time it has spread at the rate of 6 miles a year, but no long jumps have taken place. The problems presented by tourist travel, immigrant travel, and other interstate relations are factors that must be further studied to retard the spread of the insect. It is essential that there be a uniformity of quarantines in order that the greatest protection may be secured with the least interruption of every-day activities.

Natural control of the alfalfa weevil by the introduction of *Bathyplectes curculionis* from Europe is being pursued by the U.S. Bureau of Entomology, and it is hoped that future introductions may solve the control of the pest.

Vorthley (L. H.). U.S. Bur. Ent. **A Survey of the Corn Borer Situation in 1925.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 400-407, 1 fig. Geneva, N.Y., April 1926.

The following is taken from the author's summary: This paper onsists of an account of the present status of the investigation of *'yrausta nubilalis*, Hb. (European corn borer) in the United States vith special reference to dispersion, quarantine and inspection, scouting, nd control measures. While the spread in New England and Eastern lew York during 1925 was small, the infested area in the States border-ng on Lake Erie, *viz.*, Western New York, Pennsylvania, Ohio and lichigan was increased to 30,237 sq. miles. Progress has been made n the development of machinery for cutting maize close to the ground n order to prevent the establishment of strong colonies of the borer.

pecial Reports prepared under the Direction of the Sub-Committee on Insecticides and Appliances, Committee on Policy.—*Jl. Econ. Ent.*, xix, no. 2, pp. 407-412. Geneva, N.Y., April 1926.

Questionnaires were sent out as in the previous year [*R.A.E.*, ., xiii, 340], and information contained in the replies may be sumiarised as follows: In the eastern States the original boiled lubricating il emulsion was recognised as the most generally satisfactory. The easons for its being preferred to the cold-mixed emulsions were its iore complete emulsification and stability, the fact that the stock mulsion could be prepared days in advance, that it is apparently more olproof, and that commercial concerns are preparing a good stock mulsion at a reasonable cost and most growers prefer the ready repared emulsion at a slight additional expense.

In the western States a preference was shown for the cold-mixed mulsion, especially with calcium caseinate emulsifier. The reason nderlying this preference was that there was universally less difficulty vhere hard water was used, a problem that cannot be overlooked n many of the western States. There seems little difference in the ffectiveness of the boiled and cold-mixed emulsions, but there may be ome difficulty in making the latter unless the caseinate is quite fresh. n some cases copper sulphate emulsifier was preferred, the formula eing 1 U.S. gal. oil, 2-4 oz. copper sulphate, 2-4 oz. hydrated lime and U.S. gal. water. A satisfactory spray for *Citrus* under Californian onditions consists of 3-4½ U.S. gals. triumph oil, 4-6 U.S. gals. lime-ulphur, and calcium caseinate at the rate of 1 lb. to each 100 U.S. gals. f diluted spray. In Oregon 2 oz. copper sulphate were added to prouce a less viscous stock solution.

The formulae for the two outstanding emulsions as shown above are) the original boiled lubricating oil emulsion consisting of 1 U.S. gal. l, 1 lb. potash fish-oil soap, and ½ U.S. gal. water, and (2) the alcium caseinate cold-mixed oil emulsion in which 2 oz. caseinate e substituted for the fish-oil soap. The amount of caseinate used aried up to 8 oz., and though no definite conclusions can be drawn to the optimum amount, the data indicate that the minimum mount or slightly more is preferable to an excess, which does not nprove the spray and makes its preparation more difficult.

The injury to the trees resulting from the use of lubricating oil nulsion varies with the strength used and time of application, and it generally agreed that, at present, summer oil sprays should not be recommended for deciduous trees except in special emergen cases. The so-called white oils are less dangerous for *Citrus* an summer sprays, but their use is limited owing to cost. Soap is co sidered the best emulsifier for boiled, and calcium caseinate for co mixed emulsions.

As a rule spraying when temperatures are below freezing is le effective and more injurious.

The work for the year in connection with calcium cyanide is reviewe The action of this material both on plants and insects is greatly affect by climatic conditions. There is very little correlation in the expe mental work, and there is a great need for more cooperation betwe the different workers in various States and those of the Feder Government.

WELLS (A. B.). **Notes on** *Hylobius pales* **Boh. and** *Pissodes str* **Peck as Nursery Pests.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 412-41 Geneva, N.Y., April 1926.

Hylobius pales, Boh., and *Pissodes strobi*, Peck, are responsible considerable injury to pines, spruces and firs in nurseries Pennsylvania. The presence of the larvae of these weevils in t roots is not suspected until the bark is removed, but the adults a noticeable owing to the scored stems.

FO CHING WOO. **The Chinese Cotton Geometrid** (*Boarmia* **sp.) and Possible Introduction (Lepid.).**—*Jl. Econ. Ent.*, xix, no. 2, pp. 41 413. Geneva, N.Y., April 1926.

A species of *Boarmia* is a serious pest of cotton in China. As an adu containing 244 eggs was taken on deck in mid ocean 5 days befo arriving at Seattle, and 13 days after sailing from China, the possibili of the introduction of this moth into the United States, despite efforts of quarantine officers, is pointed out.

CORY (E. N.). **Fruit Insect Problems for 1925.**—*Trans. Peninsu Hortic. Soc. 1926*, pp. 34-37. Dover, Del., 1926.

Experiments for the control of codling moth [*Cydia pomonella*, L indicate a slight advantage in spraying over dusting. Against Aphi on apples, the addition of nicotine to the delayed dormant spra of lime-sulphur proved the best method in certain localities; others, oil sprays applied after the Aphids had hatched gave bett results.

Owing largely to the rapid increase of parasites, the oriental pea moth [*Cydia molesta*, Busck] caused less injury than was expecte Experiments for its control were inconclusive. Apparently applic tions of lead arsenate before the oviposition of the third brood ha little effect on the resultant fruit infestation. Continued heav infestation is recorded on quinces, migration to which takes pla at the time of the third brood.

A number of proprietary brands of oils were tried for the control the terrapin scale [*Lecanium nigrofasciatum*, Perg.] on peach tree but in no instance were they sufficiently effective to give control one season's work.

ORY (E. N.). **The Potato Tuber Moth.**—*Trans. Peninsula Hortic. Soc. 1926*, pp. 51-56. Dover, Del., 1926.

An account is given of *Phthorimaea operculella*, Zell. (potato tuber oth) in Maryland, and its control [*R.A.E.*, A, xiv, 286].

ontrolling Pear Psylla with Sprays and Dusts.—*New York State Agric. Expt. Sta.*, Bull. 527 (popular edition), 15 pp., 4 pls., 1 fig. Geneva, N.Y., March 1926.

This is a non-technical summary of a bulletin on the control of *sylla pyricola*, Först., already noticed [*R.A.E.*, A, xiv, 169].

ENTON (F. A.). **A Case of Arsenical Injury to Tomato Plants.**—*Proc. Iowa Acad. Sci. 1924*, xxxi, pp. 135-137, 4 figs. Des Moines, Iowa, 1925. [Recd. April 1926.]

The wilting and dying of tomato plants was found to have been ue to injury to the base of the stems, just below the soil, caused y water-soluble arsenic from a poisoned bran mash containing Paris reen. The bran mash had been placed in lumps at the base of each lant, instead of being scattered evenly over the field ; subsequent ultivation and watering had brought the soluble arsenic into contact ith the stems, producing an area of dead tissue that resulted in the eath of the plants when it completely encircled the stems.

ENTON (F. A.). **Notes on the Biology of the Leafhopper** *Eutettix strobi* **Fitch.**—*Proc. Iowa Acad. Sci. 1924*, xxxi, pp. 437-440, 3 figs., 6 refs. Des Moines, Iowa, 1925. [Recd. April 1926.]

The effect of the feeding of the nymphs of *Eutettix strobi*, Fitch, on he leaves of pigweed (*Chenopodium album*) is described ; the haracteristic crimson spots that it produces do not appear in less than 4 hours. Adults apparently do not produce spotting on the leaves. here are at least two generations a year in Iowa ; the nymphs of the irst appear in May or June, and those of the second in June or July. he nymphal stage lasts from 17 to 25 days.

NYDER (T. E.). **Preventing Damage by Lyctus Powder-post Beetles.**—*U.S.Dept. Agric.*, Farmers' Bull. 1477, 12 pp., 10 figs. Washington, D.C., March 1926.

Much of the information on measures against *Lyctus* spp. in this ulletin is the same as that contained in a previous one [*R.A.E.*, A, v, 434]. Whenever possible heart-wood should be used instead of sapwood for such articles as implement handles ; it is just as strong and s not attacked by *Lyctus*. Wood that has been submerged in water for four months or longer or wood that has been steamed under ressure for from 10 to 20 hours is also immune from attack.

In addition to kerosene, orthodichlorobenzene may be used for treating wood to kill the larvae ; wooden articles should be saturated with this substance by using a rag or a brush, or it may be applied to structural woodwork as a spray. The larvae can also be killed by eating infested wood in a kiln for half an hour or more (according to he dimensions of the material) at 180° F. Provided that the humidity s sufficiently high to prevent surface drying, the mechanical properties of the wood are not materially impaired by subjection to this temperature for an hour. Steaming the wood for 1½ hours in a saturated atmosphere at a temperature of 135° F. is equally effective. Creosote acts as a repellent as well as a larvicide, and although many wooden articles cannot be treated with it on account of the stain that it leaves, they can be protected by storing in sheds in which the woodwork has been creosoted.

The Braconid, *Hecabolus lycti*, Cress., is the most important parasite of *Lyctus planicollis*, Lec., and has been reared in large numbers. Among the beetles predacious on *L. planicollis* are the Clerid, *Tarsostenus univittatus*, Rossi, and the Histerid, *Teretriosoma americanum*, Lec. The Psocid, *Troctes divinatoria*, Müll., the Dermestid, *Trogoderma inclusum*, Lec., and the Cucujids, *Silvanus surinamensis*, L., and *Laemophloeus* spp., which are often associated with *Lyctus*, are merely scavengers.

MAXSON (A. C.) & HOTTES (F. C.). **A New Tribe and a New Species in the Subfamily Pemphiginae (Homop.: Aphididae).**—*Ent. News*, xxxvii, no. 5, pp. 129-133, 1 pl., 3 refs. Philadelphia, Pa., May 1926.

Georgia gillettei, sp. n., is described from Iowa. It was found on the lower surface of the leaves of *Ulmus americana*.

EWING (H. E.). U.S. Bur. Ent. **Two New Spider Mites (Tetranychidae) from Death Valley, California (Acarina).**—*Ent. News*, xxxvii, no. 5. pp. 142-143. Philadelphia, Pa., May 1926.

Tetranychus thermophilus, sp. n., and *Petrobia drummondi*, sp. n., are described from California on greasewood (*Colvillia* sp.).

The Pink Bollworm in Texas.—*Qtrly. Bull. State Plant Bd. Mississippi*, v, no. 4, pp. 1-3. A. & M. College, Miss., January 1926. [Recd. April 1926.]

There was a general increase in the damage done by pink bollworm [*Platyedra gossypiella*, Saund.] in the western irrigated sections of Texas during 1925, amounting in some areas to 25 per cent. in spite of the measures applied in the autumn of 1924. There was more rainfall than usual in 1925, and if there is any relation between this and the increased damage, it would indicate that *P. gossypiella* would be a much worse pest in Mississippi and other southern States than in the dry western sections where it now occurs.

This pest has recently been found hibernating in cocoons in the ground, where it can withstand frost, snow, and other unfavourable conditions. This may, to a certain extent, explain the heavy infestation in fields that were carefully cleaned up the year before. Many infestations occurred at distances of from 25 to 40 miles from where cotton had been planted the previous year. These were probably due to moths drifting on wind currents blowing from infested parts of Mexico. The suggestion of a non-cotton zone, 300-500 miles wide, starting 5 miles east of the Rio Grande and extending to the western limits of dry farming, is being submitted to the Pink Bollworm Commission of Texas during 1926 with a view to putting it into operation in the following year. In the meantime regulated zones will be created, restricting the movement of cotton products.

Strict quarantines are being maintained in Mississippi against the importation of any dangerous material from infested States, and every precaution is being taken to ensure the immediate recognition of the pest.

OHLENDORF (W.). **Studies of the Pink Bollworm in Mexico.**—*U.S. Dept. Agric.*, Dept. Bull. 1374, 64 pp., 15 figs. Washington, D.C., March 1926.

This is a continuation of a study previously reported upon [*R.A.E.*, A, ix, 461]. The average annual loss due to *Platyedra* (*Pectinophora*) *gossypiella*, Saund. (pink bollworm) in Mexico is now estimated at 20 to 25 per cent. of the cotton crop, both the quantity and quality of the lint and seed being reduced. All late bolls are so heavily infested as to be practically valueless, and although the mortality of resting larvae in the field during winter and early spring is great, hardly any surviving if the fields are flooded during winter, the enormous numbers of larvae that hibernate in stored seed and in the bolls and soil in the field ensure the presence of sufficient adults to begin the infestation in the following spring. The attacks of parasites have been spasmodic and have not as yet proved of any importance. The survival of larvae during the winter is much greater in bolls on stalks in the field than in bolls on the surface of the soil, showing the advantage of cutting and burning old stalks. The heat method of treatment of the seed is recommended (exposure to 145° F. for 3½ minutes), while by the injection of live steam into the seed mass the time of exposure can be lessened. The infestation of green bolls was reduced by as much as 60 per cent. by repeated application of arsenical dusts in the field, and this method of control seems very promising, but requires further testing.

COMPTON (C. C.). **Practical Methods of controlling Insects on Truck Crops.**—*Trans. Illinois State Hortic. Soc.*, lviii, *1924*, pp. 168-178. Springfield, Ill., January 1925. [Recd. April 1926.]

It is estimated that about 20 per cent. of the vegetable crop of the United States, which is valued at approximately £300,000,000, is destroyed annually by insects. In this paper, control measures applicable to Illinois conditions for use against some dozen of the most important vegetable pests are outlined.

PETERSON (A.). **The Oriental Peach Moth.**—*Trans. Illinois State Hortic. Soc. 1924*, lviii, pp. 183-199. Springfield, Ill., January 1925.

In the author's opinion, the oriental peach moth [*Cydia molesta*, Busck] is the most important pest in New Jersey at the present time, the chief method of dispersal being the distribution of fruit. Quinces and late peaches are the most severely attacked. The moths of the first generation emerge in New Jersey during the first week in May, and there are three full generations and a partial fourth. The method of injury and control are discussed [*R.A.E.*, A, xiii, 253 ; xiv, 144, etc.]

In the discussion following this paper the author remarked that in regard to apple Aphids the best results are obtained in New Jersey by a delayed dormant spray just before the young leaves come out ; this is because the eggs are covered with two shells, the tough outer one splitting from 2 or 3 weeks to 2 or 3 days before the eggs actually hatch.

BROCK (W. S.). **Dusting to control Peach Pests.**—*Trans. Illinois State Hortic. Soc., 1924,* lviii, pp. 505-511. Springfield, Ill., January 1925. [Recd. April 1926.]

In experiments made in Illinois to test the value of sulphur lead arsenate dusts in the control of peach pests, a first application was made on 11th April, a second on 30th April, and a third on 30th June. The dust used consisted of 80 per cent. superfine sulphur, 10 per cent. lead arsenate and 10 per cent. hydrated lime. The percentage of fruit showing injury by curculio [*Conotrachelus nenuphar*, Hbst.] after dusting was 3·9, as against 0·6 per cent. on trees sprayed five times, while on untreated trees 26·3 per cent. was injured.

Outstanding Entomological Features in the United States for November and December, 1925, and January, 1926.—*Insect Pest Survey Bull.*, vi, no. 1, pp. 1–24 . [Washington, D.C.] 1st March 1926.

A summary is given of reports received from various States outlining the conditions with regard to the more important insect pests, with a view to assisting workers to plan their programmes for the coming spring and summer. The pests dealt with are *Mayetiola destructor*, Say (Hessian fly) ; *Blissus leucopterus*, Say (chinch bug) ; *Toxoptera graminum*, Rond. (green bug) ; Acridids (grasshoppers) ; *Aspidiotus perniciosus*, Say (San José scale) ; and *Anthonomus grandis*, Boh. (boll weevil).

HAMILTON (C. C.). **Insect Pests of Boxwood.**—*New Jersey Agric. Expt. Sta.*, Circ. 179, 14 pp., 9 figs. New Brunswick, N.J., February 1926.

This is a brief account of the life-history and control of the following pests of boxwood in New Jersey : *Monarthropalpus buxi*, Lab. (boxwood leaf-miner) [*R.A.E.*, A, xiv, 65], *Psylla* (*Psyllia*) *buxi*, L. (boxwood psylla), *Lepidosaphes ulmi*, L. (oyster-shell scale), and the spider-mite, *Paratetranychus yothersi*, McGregor. *P. buxi* probably passes the winter in the adult stage ; the eggs are laid on the leaves at the tips of the new shoots in the spring ; the nymphs appear at the end of April in Maryland and feed on the leaves, on which they produce a characteristic curling, until June or July. Adults occur in New Jersey in July and August. This Psyllid was probably introduced into the United States from Holland, in which country it has been satisfactorily controlled by spraying with carbolineum [*R.A.E.*, A, iv, 154 ; xii, 140]. Control measures are not often necessary, but the nymphs were killed by the molasses and nicotine sulphate sprays used against *M. buxi* [*R.A.E.*, A, xiv, 65], and spraying with nicotine sulphate solution 1 to 500 with 3-4 lb. soap to 50 U.S. gals. should be effective.

Considerable damage to boxwood is often caused by *L. ulmi* ; according to J. B. Smith there are two generations a year in southern New Jersey, but only one in the northern part of the State. Dormant sprays have not been tested on boxwood in the United States, and their effect on the foliage is therefore doubtful ; spraying twice at an interval of two weeks, in May or June, when the eggs are hatching, with 8 lb. potash fish-oil soap in 50 U.S. gals. water is recommended.

P. yothersi passes the winter in the egg stage, and the eggs hatch in April. The mites breed freely on the leaves of boxwood, often causing considerable injury, especially in dry seasons, discolouring the leaves and causing them to drop off; there are five or six generations in the course of the summer. All adults and young mites can be killed by dusting thoroughly with fine sulphur, which is retained on the leaves by the webbing of the mites, and kills also the mites that subsequently hatch from the eggs. A proprietary soap oil emulsion and the above-mentioned potash fish-oil soap spray killed all mites and eggs with which they came in contact, but it was difficult to wet the plants thoroughly with them. Syringing with water and spraying with nicotine sulphate solution reduced the infestation temporarily only.

HAMILTON (C. C.). **The European Red Mite.**—*New Jersey Agric. Expt. Sta.*, Circ. 187, 8 pp. New Brunswick, N.J., April 1926.

Oil sprays if thoroughly applied in the spring just before the buds begin to swell will give satisfactory results against the eggs of the European red mite [*Paratetranychus pilosus*, C. & F.]. A dilute solution applied thoroughly will give better results than a stronger one applied with less care. In experiments there was very little difference between the results obtained with proprietary miscible oils used at the recommended dilution to make a spray containing 5-6·3 per cent. oil, and lubricating oils and soap emulsions diluted to contain 2 per cent. oil, in spite of the difference in oil content and cost, the lubricating oil emulsions wetting the twigs better and being much cheaper. Lime-sulphur, 1 : 9, even with the addition of nicotine sulphate, 1 : 500, was unsatisfactory, over 30 per cent. of the eggs hatching.

Spraying should be done in the spring, as late in the dormant season as is possible with existing weather conditions and orchard practices. Where a delayed dormant spray of lime-sulphur and nicotine is to be applied against Aphid eggs, the oil spray for *P. pilosus* should be applied about a week or ten days before on apple, but on peach it may be applied after the lime-sulphur spray for peach leaf-curl, in which case the oil spraying should be finished before the peach buds have swelled to any extent. Oil sprays should not be applied when the temperature is below 45° F. or is expected to drop to freezing immediately after spraying.

For the summer control of *P. pilosus*, lime-sulphur, 1 : 75, with the addition of a spreader, such as flour, powdered skimmed milk, or calcium caseinate, is recommended. The spray should not be applied at temperatures of 85° F. or over. It is particularly important to use a dormant spray on peaches, as all summer sprays that would kill *P. pilosus* are injurious to peach foliage.

HAMILTON (C. C.). **The Eastern Tent Caterpillar** (*Malacosoma americana*, **Fabr.**).—*New Jersey Agric. Expt. Sta.*, Circ. 188, 8 pp., 5 figs. New Brunswick, N.J., April 1926.

This is a popular account of *Malacosoma americana*, F., as occurring in the eastern and central parts of the United States. The remedies include hand collection of the egg-masses, brushing the nests or tents from the trees and crushing the larvae, or burning out the nests on neglected trees, and dusting the foliage on which the caterpillars are feeding with lead arsenate mixed with 4 parts of wheat flour or of hydrated lime, or spraying it with 1 to 1½ lb. lead arsenate to 50 U.S. gals. water.

Dean (G. A.) & Hungerford (H. B.). **The San José Scale (*Aspidiotus perniciosus*, Comstock).**— *Kansas Ent. Commiss.*, Circ. 8, 8 pp., 3 figs. Topeka, Kansas, 1926.

An account is given of the life-history and distribution of *Aspidiotus perniciosus*, Comst., with recommendations for its control. The latter include pruning and destroying all hopelessly infested plants and spraying during the dormant condition with lime-sulphur or miscible oils.

Wingard (S. A.). **Studies on the Pathogenicity, Morphology and Cytology of** *Nematospora phaseoli.—Bull. Torrey Bot. Club*, lii, no. 6, pp. 262-264, 3 pls., 6 pp. refs. Lancaster, Pa., 7th June 1925.

Natural infection of *Phaseolus lunatus* (lima beans) and of species of *Vigna* (cowpeas) with *Nematospora phaseoli* is apparently entirely due to the punctures of *Nezara hilaris* (green soldier bug). This bug is always present whenever infection occurs, and the lesions on the cotyledons develop round its punctures. The severity of infection depends directly upon the number of bugs present, and this, with the high temperature, explains why the percentage of infection is high during the latter part of the season.

Schoene (W. J.). **Fifteenth Report of the State Entomologist and Plant Pathologist 1924-1925.**—*Qtrly. Bull. Virginia State Crop Pest Commiss.*, vii, no. 4, pp. 5-31, 3 figs. Blacksburg, Va., January 1926.

In the autumn of 1923 *Phthorimaea operculella*, Zell., was discovered in Virginia, the infested area amounting to about 50 sq. miles. In view of the climatic conditions, sandy soil and the practice of digging the potatoes at or before maturity, it is not expected to be a pest of very serious importance. Considerable damage was done to the second crop of 1925, which was retarded owing to prolonged drought, but it is believed that with some slight changes in the method of handling the crop serious injury can be prevented in the future.

The information concerning *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental peach moth) has already been noticed [*R.A.E.*, A, xiii, 85].

Eulia velutinana, Wlk. (red-banded leaf-roller) is more difficult to control than *Cydia pomonella*, L. The larvae feed on the skin of the fruit and may become one of the worst apple pests. A thorough application of lead arsenate at the rate of 1½ lb. in 50 U.S. gals. kills the larvae in a few days. During 1925 effective control was obtained by 3 applications, which included a calyx spray, a four weeks spray and a special treatment 8 weeks after petal fall. In some seasons an August spray will be necessary. The larvae feed on the lower surface of the leaves and often reach maturity in the shoots and foliage on the inner limbs, so that the spray must be thoroughly applied to all these surfaces.

The winter is passed in the pupal stage in old leaves and débris under the tree. The moths emerge as early as the green bud stage of the apple. Oviposition continues until the trees are in bloom or later, but the eggs do not hatch before they are in full bloom, just a few days before the calyx spray. The newly hatched larva crawls at once to the lower side of the leaves and later may secure a leaf to the fruit, the leaf thus becoming a protective covering. After 25-30 days the larva pupates at the place of feeding. During a normal season there are four broods of larvae, the first being most active in May, the second in June and July, the third from August to November and the fourth from September to November. The feeding period becomes longer in the autumn. The overwintering pupae appear in November.

Anthonomus grandis, Boh. [*R.A.E.*, A, xii, 205] has now spread over the entire cotton-growing territory, and serious losses from it may be expected in 1926 and 1927.

The total cost to commercial apple orchards as a result of the depredations of *Cydia* (*Carpocapsa*) *pomonella*, L., and cost of spraying material was estimated at approximately £120,000 for 1919. The life-history of this pest has now been studied over a period of five years; sometimes there is a full first generation, with a partial second and partial third, whereas in other years there is only one and a partial second. The only satisfactory way of timing the sprays in commercial orchards is to watch the development of the insect.

Eriosoma lanigerum, Hausm. (woolly apple aphis) is most injurious to nursery trees and newly planted orchards, and even then the damage is confined to certain localities. The results of the first year's work have already been noticed [*R.A.E.*, A, xiii, 386]. It is believed that the ultimate solution of the problem will be the propagation of resistant stock.

A brief description is given of a barn in which at least part of the maize crop should be stored to prevent future losses due to *Sitotroga cerealella*, Oliv. (angoumois grain moth). This can be opened for ventilation or closed and made airtight for fumigation.

To prevent losses as a result of attack by *Dendroctonus frontalis*, Zimm. (southern pine beetle) on *Pinus virginiana*, the timber should be used as soon as possible after the injury is noticed; it should be converted into lumber or cordwood and the bark destroyed at once, or at least before the beetles have had time to mature.

In view of the importance of the time of silking on infestation of maize by *Heliothis obsoleta*, F. (corn ear worm), investigations have been started in order to ascertain the possibilities of planting maize so that the silk will appear when the moths are least numerous.

Nezara hilaris, Say (green soldier bug) is responsible for the dissemination of the disease caused by *Nematospora phaseoli* among lima beans [*Phaseolus lunatus*] and cowpeas [see preceding paper]. Previous recommendations against this species and *N. viridula*, L., are reviewed [*R.A.E.*, A, vi, 495; xi, 83].

During 1924 an outbreak of *Megalopyge opercularis*, S. & A., occurred at Reedsville. Besides being a nuisance owing to their urticating hairs the larvae injured the foliage of a large number of trees. The chief injury occurred on the terminals on the highest parts of the trees. The numerous plants attacked included fruit trees, shade trees, raspberries, strawberries, beans and roses. Spraying with lead arsenate is recommended [*R.A.E.*, B, xii, 26].

STURTEVANT (A. P.). **The Sterilisation of American Foulbrood Combs.** —*U.S. Dept. Agric.*, Dept. Circ. 284, 28 pp., 27 refs. Washington, D.C., March 1926.

An entirely new treatment of American foulbrood of bees has been inaugurated with the use of disinfectants for the sterilisation of infected combs. A 20 per cent. solution of formalin in water has proved the most satisfactory disinfectant for sterilising infected combs, both with regard to its germicidal action and low cost, but it must be used carefully. All honey should be extracted, brood cappings removed, and the combs treated for at least 24 hours, or for 48 hours if it is desirable to wash them in water after treatment. Further tests are required, however, under apiary conditions. The successful sterilisation of combs is of little value unless every precaution is taken to prevent recurrence of the disease.

Quarantine on account of the Pink Bollworm. Regulations (3rd Revision) under Quarantine no. 52.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 7 pp. Washington, D.C., 26th February 1926.

These regulations on account of *Platyedra gossypiella*, Saund., supersede a former revision [*R.A.E.*, A, xi, 426] and require vacuum fumigation of cotton lint, linters and cotton samples moving interstate from an infested area, revise areas quarantined, and make provision for interstate movement for disinfection and for the cleaning of infested fields. They came into force 1st March 1926.

Hawaiian and Porto Rican Quarantine covering Sand, Soil, or Earth, with Plants. Notice of Quarantine, no. 60.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 1 p. Washington, D.C., 19th February 1926.

To prevent the spread of injurious insects, including species of *Lachnosterna* (*Phyllophaga, Phytalus*), *Adoretus umbrosus* var. *tenuimaculatus* and several species of termites, no sand, soil, or earth round the roots of plants may be moved from Porto Rico and Hawaii into the United States, except for experimental or scientific purposes. This quarantine came into force 1st March 1926.

COOK (M. T.) & DOZIER (H. L.). **Spraying Citrus Fruits in Porto Rico.**—*Porto Rico Insular Expt. Sta.*, Circ. 88, 23 pp., 5 figs., 3 refs. Rio Piedras, P.R., 1925. [Recd. April 1926.]

In Porto Rico the spray most generally used for the control of fungi and scale-insects is Bordeaux-oil, the making of which is described : it is an ordinary Bordeaux mixture with the addition of 1½ gals. of oil emulsion in each 100 gals. The use of Bordeaux mixture is sometimes objected to because it also kills the native entomogenous fungi that attack the scale-insects and are relied upon by many growers, who plant wind-breaks to provide shade and increase humidity, conditions favourable to their increase. It is, however, only under unusually favourable conditions that the scale-insects are adequately controlled by this means.

The chief scale-insects, which are the most important *Citrus* pests in Porto Rico, are *Lepidosaphes beckii*, Newm. (purple scale), *Chionaspis citri*, Comst. (snow scale), *Selenaspidus articulatus*, Morg. (West Indian rufous scale), and *Chrysomphalus aonidum*, L. (Florida red scale) ; they are controlled by spraying with Bordeaux-oil or oil emulsion, for which several formulae are given [*R.A.E.*, A, xii, 319 ; xiii, 258, etc.].

Phyllocoptes oleivorus, Ash. (rust mite) is also a serious pest of *Citrus*, attacking both leaves and fruit ; it can usually be controlled by a single application of lime-sulphur (1 part to 66 of water) or sulphur dust. Outbreaks of this mite and of scale-insects may follow spraying with Bordeaux mixture. *Aleurothrixus floccosus*, Mask. (woolly whitefly) occurs commonly in Porto Rico on *Citrus* and many other plants, but is kept in check by the Chalcid, *Eretmocerus californicus*, How.

WALTERS (E. A.). **Control of Insect Pests.**—*Rept. Agric. Dept., St. Lucia, 1924,* pp. 9–10. [Trinidad] 1926.

Coconuts were attacked by *Aleurodicus cocois*, Curt. (coconut whitefly) and *Pseudococcus nipae*, Mask., and, to a less extent, by *Vinsonia stellifera*, Westw. (star scale); these pests damaged the mature leaves, especially on trees in exposed places, during the dry season from February to May, but their numbers were reduced by the fungi, *Myriangium duriaei* (black scale fungus), *Cephalosporium lecanii* (shield-scale fungus) and *Sphaerostilbe coccophila* (red-headed fungus), when the weather became wet. *Metamasius sericeus*, Ol. (striped weevil-borer) damaged a few coconut palms.

Cosmopolites sordidus, Germ. (banana weevil) attacks all kinds of bananas in the island, the usual control measures [*cf.* *R.A.E.*, A, xiv, 177] being employed against it. The Dynastid, *Ligyrus ebenus*, DeG. (*Tomarus bituberculatus*, Beaud.) also occurs in most banana gardens, especially where tannias [*Colocasia*] and similar crops are grown and neglected. Limes in exposed places were attacked by *Chionaspis citri*, Comst. (snow scale), but it was kept in check by *Myriangium duriaei*. *Alabama argillacea*, Hb., on cotton, was controlled by hand-picking and by dusting with Paris green and lime.

The importation of the ground lizard, *Meiva dorsalis*, from Montserrat has been discontinued, as it failed to establish itself owing to the fact that it was preyed upon by the mongoose. The Coccinellids, *Megilla maculata*, DeG., and *Cycloneda sanguinea*, L., are useful predators, and the protection of insectivorous birds would probably prove of value in the reduction of insect pests.

SHEPHERD (F. R.) & HOWELL (W.). **Work in Connection with Insect and Fungus Pests and their Control.**—*Rept. Agric. Dept. St. Kitts-Nevis, 1924–25,* pp. 5–6 & 33–34. [Trinidad] 1925. [Recd. May 1926.]

In St. Kitts the only sugar-cane pest of any importance is *Diatraea saccharalis*, F. (moth borer), but the loss caused by this moth under normal weather conditions is not great, and it does not seem to be on the increase. The position with regard to the infestation of cotton by *Alabama argillacea*, Hb. (cotton worm) and *Platyedra* (*Pectinophora*) *gossypiella*, Saund. (pink bollworm) was the same as in the previous year [*R.A.E.*, A, xiii, 493].

In Nevis *D. saccharalis* was not very prevalent; infestation of cotton by *A. argillacea* was very severe during the early part of the season, and much damage was done by it in the windward part of the island in May and June. *P. gossypiella* did little damage to early cotton, but severely infested the late-planted and second crops. *Dysdercus andreae*, L. (cotton-stainer) was scarce during the season, but its native food-plants, which had been cut down, are re-appearing. In September the new growth of cotton was severely attacked by *Eriophyes gossypii*, Banks (leaf-blister mite).

Work in Connection with Insect and Fungus Pests and their Control. —*Rept. Agric. Dept. Antigua, 19*[*23–*]*24,* p. 7. [Trinidad] 1925. [Recd. May 1926.]

Lachnosterna antiguae, Arr. (brown hard-back beetle) was less prevalent than in previous years, particularly where *Cordia interrupta,* the introduced food-plant of the adults of its Scoliid parasite, *Tiphia parallela,* Smith [*R.A.E.,* A, xiii, 346], is growing well. The other pests of sugar-cane and the pests of cotton were the same as in the two previous years [*loc. cit.*], but *Platyedra gossypiella,* Saund. (pink bollworm) was not much in evidence, and is apparently being kept under control by the fumigation of cotton seed at the ginnery and the selection and re-fumigation of seed for planting.

Bertoni (A. de W.). **Himenópteros nuevos o poco conocidos.** [New or little-known Hymenoptera.]—*Rev. Soc. cient. Paraguay,* ii (1925), no. 1, pp. 74–79, 1 ref. Asuncion, 1926.

The Chalcid, *Pseudochalcis dircennae,* is recorded from the cocoons of *Galleria mellonella.* This parasite has a wide distribution in South America.

Lahille (F.) & Joan (T.). **Contribución al estudio del bicho de cesto** (*Oeceticus kirbyi,* **Guild.).** [A Contribution to the Study of the Bagworm, *O. kirbyi.*]—*Argentina : Minist. Agric.,* Circ. 583, 97 pp., 9 figs., 11 pls., 17 refs. Buenos Aires, 10th March 1926.

The common bagworm found in Argentina is *Oeceticus kirbyi,* Guild., of which the varietal name *platensis,* Berg, is considered unjustified. Descriptions of the various stages and particulars of the life-history are given, much of the data being taken from existing literature. *O. geyeri,* Berg, the caterpillar of which infests various species of *Acacia,* also occurs in Argentina.

Magarinos Torres (A.). **Urge termos um bom serviço de defesa sanitaria vegetal.** [The Necessity for a good Plant Protection Service in Brazil.]—*Brasil agricola,* xi, no. 2, pp. 41–43, 3 figs. Rio de Janeiro, February 1926.

This article urges the improvement of the Brazilian plant protection service on the lines of the U.S. Bureau of Entomology. The fact that both the pink bollworm of cotton, *Platyedra gossypiella,* and the coffee-berry borer, *Stephanoderes hampei* (*coffeae*) have found their way into Brazil is evidence of the need for an effective service.

de Azevedo (A.). **O** *Aleurothrixus floccosus* **Maskell nos laranjaes bahianos.** [*A. floccosus* in the Orange Plantations of Bahia.]—*Correio-agric.,* iv, no. 2, p. 83. Bahia, February 1926.

The chief insect pest of oranges in Bahia is the Aleurodid, *Aleurothrixus floccosus,* Mask. Efforts are being made to effect its control by means of the fungus, *Aschersonia aleurodis.*

PARKER (T.). **Insecticides—Arsenical and otherwise.**—*Chem. Trade Jl. & Chem. Engineer*, pp. 251–253. [Manchester] 26th February 1926.

Much of the information contained in this paper has been noticed from another source [*R.A.E.*, A, xiv, 218]. The work of various investigators regarding the possibilities of non-arsenical insecticides is discussed, and it is suggested that a conference between the British and American agricultural authorities on the subject of arsenic on fruit and the best plan of action to follow in the interests of all concerned would probably accomplish much.

Spraying Calendar for Apple Orchards.—*Govt. N. Ireland: Minist. Agric.*, Leaflet no. 33, 5 pp., 4 figs. Belfast, 1926.

A spraying programme for apple orchards in Northern Ireland is given, with directions for the preparation of the necessary spray mixtures.

PETHERBRIDGE (F. R.) & KENT (W. G.). **The Control of the Apple Capsid Bug.**—*Jl. Minist. Agric.*, xxxiii, no. 1, pp. 50–57. London, April 1926.

The apple Capsid [*Plesiocoris rugicollis*, Fall.] can be effectively controlled by the proper application of soft soap and nicotine sprays. Failure of this method has been traced to spraying at the wrong time, incorrect methods of spraying, and unsuitable water. The hatching of the eggs of *P. rugicollis* may take place in a week, though it may extend over a month; it is therefore insufficient to spray only when the larvae are first observed. Although the date and period of hatching varies from year to year, all the eggs have usually hatched by a week or 10 days before the apple trees are in full bloom, and it is then that spraying should be carried out. A pump giving a pressure of over 70 lb. per square inch should be employed, and the spray should be applied through a coarse nozzle directed downwards and moved along each shoot at a distance of 6–12 inches.

The water available for spraying in the Wisbech district, where *P. rugicollis* is particularly troublesome, is almost all too hard for use with soft soap, requiring up to 28 lb. per 100 gals. to soften it. A series of experiments was carried out in which the results of spraying with 3¼ oz. nicotine (95–98 per cent.) and 4 lb. soft soap in 40 gals. rain-water were compared with those obtained with a spray in which hard water was used and ⅘ pint of sodium caseinate was substituted for the soft soap. The formula for the sodium caseinate is as follows: Commercial casein, 20 oz.; caustic soda, 3 oz.; water 2½ gals.; the caustic soda is heated in the water, and while this is done the casein is added very gradually and stirred frequently; the liquid is boiled for 10 minutes. On plots sprayed both before and after flowering, or before flowering only, with either of the above two sprays, at the rate of about 3½ gals. a tree (13–15 years old), from 60 to 80 per cent. unmarked apples were obtained, and up to 11 per cent. badly marked, compared with from 4 to 31 per cent. unmarked, and up to 82 per cent. badly marked on unsprayed plots. Slightly better results were obtained with two applications than with one, and particularly good results with a spray consisting of sodium caseinate, ⅘ pint; nicotine (40–45 per cent.), 7½ oz.; lead arsenate, 2 lb.; lime-sulphur, 1 gal.; and hard water, 39 gals. The soap sprays wet the trees more easily than the caseinate ones, which take a little longer to apply, requiring rather more liquid per tree. Dusting with 1 or 2 per cent. nicotine or nicotine sulphate did not give satisfactory results.

SMITH (K. M.). **Chrysanthemum Eelworm.**—*Jl. Minist. Agric.*, xxxiii, no. 1, pp. 57–60, 1 pl., 4 refs. London, April 1926.

Serious damage to chrysanthemums in Lancashire and Cheshire has recently been caused by the eelworm, *Aphelenchus ritzemabosi*, Schwartz, which causes the lower leaves to turn yellow at the edges and finally die. A distortion of the leaves appears also to be connected with this eelworm. Other workers have stated that the Nematodes live and reproduce in the mesophyll of the leaves, and are carried to the soil in the fallen leaves; the adults survive in a partly dormant condition on the surface of the soil for long periods [*cf.* *R. A.E.*, A, xiii, 83], and when revived by moisture pass up the outside of the stem of a suitable plant and enter the leaves by the stomata or possibly by a wound. Small clusters of Nematodes have been found on the leaves, and it is suggested that these may be in the act of migration.

Experiments are in progress to test the effect of immersing chrysanthemum cuttings in hot water, as Nematodes are usually readily controlled by heat. The cuttings will not withstand immersion for two minutes in water of a temperature above 112° F. (45° C.).

Cuttings should be taken from healthy plants, and soil that may be infested should not be used. All infested plants and leaves should be burned.

A list is given of varieties of chrysanthemums classed according to their susceptibility to this eelworm; no immune variety has been discovered.

HERCE (P.). **Observaciones sobre una plaga del peral** (*Eriophyes pyri*, **Pagenst.**). [Observations on a Pear Tree Pest, *E. pyri*.]—*Bol. Estación Pat. veg.*, i, no. 1, pp. 8–10, 2 figs. Madrid, January 1926.

This is a brief account of *Eriophyes pyri*, Pag., and of the damage it does to pear trees. For spraying in autumn the formula advised is flour 5 lb., soft soap 10 lb., lubricating oil 6–8 gals., and water 100 gals. If the infestation is very severe, spraying in spring is necessary, the formula being sulphur 1 lb., soft soap 3 lb., water 10 gals. This mite is not a serious pest in Spain.

BENLLOCH (M.). **Algunas notas sobre el empleo de los aceites minerales y algunos otros como insecticidas.** [Some Notes on the Use of mineral and some other Oils as Insecticides.]—*Bol. Estación Pat. veg.*, i, no. 1, pp. 14–17. Madrid, January 1926.

Poutier's formula for an oil emulsion [*R. A.E.*, A, xiii, 296] was successfully used against *Chionaspis euonymi*, Comst., on *Euonymus*. The minimum quantity of oil given in the formula was adopted, the oil being of density 0·912 with an Engler viscosity of 4·3 at 50° C. [122° F.], *i.e.*, very similar to a motor-car lubricating oil. No bad effect on the foliage was seen. Against a Coccid on *Robinia* some scorching was noticed. Apple foliage is more resistant, but in any case this spray is best used in the dormant season. In order to adapt it for Aphids and Coccids covered with a cottony coat the mineral oil was replaced by juniper oil or by juniper oil and alcohol. The two formulae are flour 5 lb., soft soap 10 lb., juniper oil 6–8 gals., water 100 gals.; and flour 5 lb., soft soap 10 lb., juniper oil 4–6 gals., alcohol 2–4 gals., water 100 gals. Though these did not form as perfect emulsions as the first, they were good in practice. All these sprays are somewhat costly, and, as Poutier has suggested, clean oil may be replaced by oil that been used for motor-car lubrication.

BERNIÈS (J.). *Pseudococcus adonidum* **à Toulouse.**—*Bull. Soc. Hist. nat. Toulouse,* liii, no. 1–2, pp. 37–40, 2 refs. Toulouse, 25th July 1925. [Recd. April 1926.],

Pseudococcus adonidum, L., is recorded from Toulouse, not only in greenhouses, but also on ornamental plants and tomato outdoors. Eggs that had undergone a temperature of —10° C. [14° F.] hatched at about 15° C. [59° F.] in the laboratory, at first only a few but towards 25th March in large numbers. In the open, the first observed hatchings took place during the latter half of May. In spite of the fact that a few females and an occasional male appear to survive a severe winter, there is no doubt that cold weather keeps this mealybug in check.

A useful enemy of the pest in warm countries is *Cryptolaemus montrouzieri,* Muls., and attempts are being made to acclimatise this Coccinellid on the south coast of France to combat both *P. adonidum* and *P. citri,* Risso.

GAUTIER (C.) & CLEU (H.). *Microgaster sticticus* **Ruthe (Hym. Braconidae) parasite d'***Oenophtira pilleriana* **Schiff. et de** *Tachyptilia populella* **Cl. dans les Hautes-Alpes.**—*Bull. Soc. ent. France,* 1926, no. 2, pp. 21–22. Paris, 1926.

Descriptive notes are given of *Microgaster sticticus,* Ruthe, a parasite of the larvae of the Pyralid, *Sparganothis* (*Oenophthira*) *pilleriana,* Schiff., and of the Tineid, *Tachyptilia populella,* Cl.

BODENHEIMER (F. S.). **Première note sur les Cochenilles de Syrie.**—*Bull. Soc. ent. France,* 1926, no. 3–4, pp. 41–47, 1 fig., 5 refs. Paris, 1926.

The object of this paper is to collate all existing information on the Coccids of Syria.

A list of 29 species is given including *Kermes* (*Kermococcus*) *biblicus,* sp. n., found in large numbers on the small branches of *Quercus coccifera* at Beyrout.

FEYTAUD (J.). **La défense contre les vers du raisin.**—*Rev. Zool. agric. & appl.,* xxiv, no. 11, pp. 227–231. Bordeaux, November 1925. [Recd. April 1926.]

The method of cultivating and training a vine has a great influence on the degree of infestation by the vine moths [*Clysia ambiguella,* Hb., and *Polychrosis botrana,* Schiff.]. It is usually found that grapes hidden under foliage are the most severely attacked, and even on a single grape, the more a part is hidden the more likely is it to be attacked. The removal of a certain proportion of the leaves just before the maximum flight of the moths is therefore recommended, but if this practice is followed also in July and August against the third generation of *P. botrana*, only those leaves on the north and east should be removed. Besides reducing infestation, this renders insecticidal treatment easier. Early harvesting of the fruit is also recommended for reducing the numbers of *P. botrana* in the following season. The usual remedies advocated as supplementary measures include treatment of the vine stock and capture of the adults (especially applicable over large areas where there is little danger of re-infestation from neighbouring vineyards) and treatment of the grapes (particularly valuable on small areas surrounded by other vines).

RONCORONI (E.). **Le hanneton. Ravages et destruction.**—*Vie agric. & rurale*, xxviii, no. 15, pp. 231–233, 4 figs. Paris, 10th April 1926.

This is a popular account of cockchafers [*Melolontha*] and of the damage they do. The necessity for continuous collection and destruction of the adults, from the first day of their appearance until they completely disappear, is urged.

GUYOT (L.). [**Measures against** *Melolontha*.]—*Jl. Agric. prat.*, xlv, no. 15, pp. 299–300. Paris, 10th April 1926.

Cockchafers [*Melolontha*] appeared in France in 1925 earlier than usual, though vegetation was late. It was recognised that collection of the adults is of very little value unless it is practised simultaneously over the whole of an infested region, and attempts were therefore made to find some simple and cheap method of killing the larvae. Crude powdered naphthaline, used at the rate of 1 oz. per sq. yard, proved very effective. The repellent odour of the naphthaline remains much longer (about 12 days) if the soil is raked and well watered afterwards. In this case 2 applications of naphthaline are sufficient, otherwise 3 are recommended.

DEGRULLY (L.). **Traitements contre l'Altise** [*Haltica ampelophaga*].—*Progrès agric. & vitic.*, lxxxv, no. 16, pp. 367–370. Montpellier, 18th April 1926.

Haltica ampelophaga has been very numerous in vineyards in some parts of southern France. The measures recommended against this beetle have been previously noticed [*R.A.E.*, A, xi, 167]; it is suggested that lime-sulphur solution may be used as a substitute for arsenicals.

FEYTAUD (J.). **Le traitement des grappes contre l'Eudémis et la Cochylis.**—*Rev. Zool. agric. & appl.*, xxiv, no. 12, pp. 233–237. Bordeaux, December 1925. [Recd. April 1926.]

The correct moment for spraying against the vine-moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] is largely a local problem. Normal spraying includes one or two applications against the first generation of larvae and one against the second generation. Applications against the third generation of *P. botrana* are not generally recommended lest the spray should affect the quality of the wine. Formulae for both sprays and dusts, as well as suitable apparatus, are discussed.

FAURE (Jean C.). **Contribution à l'étude des Hyménoptères parasites.**—*Rev. Path. vég. & Ent. agric.*, xii, pt. 4, pp. 293–305. Paris, October–December 1925. [Recd. April 1926.]

Two hyperparasites are recorded from *Pieris brassicae*, L., *viz.*, *Spilocryptus migrator*, F., from pupae parasitised by *Pimpla instigator*, F., and *S. ferrieri*, sp. n., from pupae parasitised by *Pteromalus puparum*, L., and *Chalcis femorata*, Pnz. A more detailed illustrated description of *S. ferrieri* is to be published later.

A list is given of the parasitic Hymenoptera collected from *Polychrosis botrana*, Schiff., in Burgundy and the south-east of France during 1923–1925. Almost all the records concern parasites of the hibernating pupae, of which *Pimpla turionellae*, L., *Dicaelotus erythrostoma*, Wesm., *Exochus coronatus*, Grav., and *Pimpla alternans*, Grav., were the most important. Notes are also given on various other parasitic Hymenoptera bred in the laboratory, including *Apanteles astraches*, Marshall (*gabrielis*, Gaut. & Riel), which is parasitic on *Phlyctaenia* (*Pionea*) *forficalis*, L.

W. R. C. **La fumure potassique et les vers blancs.**—*Terre vaudoise*, xviii, no. 14, p. 211. Lausanne, 3rd April 1925.

Two cases have recently been recorded in which fields that had received a dressing of potash manure were observed to be free from white grubs [*Melolontha*], although adjacent areas not so treated were heavily infested. As long ago as 1909, a dressing of kainit combined with rolling proved very successful against these pests, and it is suggested that experiments should be made on a larger scale, using about 1,000 lb. of kainit per acre. On another area, 30 per cent. potash manure might be tried, using about 500 to 600 lb. per acre.

M[artinot] (G.). **Un nouveau désinfectant contre insectes et champignons.**—*Terre vaudoise*, xviii, no. 16, p. 240. Lausanne, 17th April 1926.

Spraying with sulphuretted hydrocarbides has given very good results against Aphids transmitting potato diseases, such as mosaic and leaf-roll. The hydrocarbide used is an oily, aromatic, yellow-brown liquid, containing one molecule of substituted sulphur, that can easily be emulsified in water by the addition of one-third of its weight of alkaline soap. The best results were obtained with 10 lb. of the emulsion per 100 gals. of water, using about 57 gallons per acre.

FAES (H.). **Les attaques sur feuilles de pommier de la chenille de** *Simaethis pariana.*—*Ann. agric. Suisse*, xxvii, pt. 1, pp. 123–125, 2 figs. Bern, 1926.

During the last few years, the larvae of *Hemerophila* (*Simaethis*) *pariana* have been very injurious on apple foliage in several of the Swiss Cantons, devouring the upper epidermis and parenchyma of the leaf until the whole tree became russet coloured. Arsenicals are most efficacious against this moth, but contact insecticides may be substituted, such as soft soap (2 per cent.) and concentrated tobacco extract (1 per cent.), or a solution of soft soap (2 per cent.) and liver of sulphur ($\frac{1}{2}$ per cent.). If sticky bands are placed round the trunks about 3 ft. from the ground, and the trees are then thoroughly shaken so that the larvae fall to the ground, they will be unable to regain the foliage.

PRIESNER (H.). **Die Thysanopteren Europas. I. Teil.**—242 pp., 3 pls. Vienna, Fritz Wagner, 1926. Price *M*. 24.

This is the first part of a treatise on the Thysanoptera of Europe, which has become necessary because of the many papers published since the appearance of Uzel's "Monographie der Ordnung Thysanoptera." It deals mainly with the more important results from the anatomical and histological aspect, ecology being considered only where needful for tracing the species. An attempt has been made to reduce the large number of genera, a broad view being taken of the generic concept. Notes on general morphology and anatomy, and on the morphology of the egg, larval and pupal stages, and a chapter on phylogeny, precede the main section on specific morphology and classification, the present part of which includes descriptions of five new species.

HUKKINEN (Y.). **On the Occurrence of the Currant Gall Mite** (*Eriophyes ribis*, **Nal. in Finland**). [*In Finnish.*]—*Suomen Maanviljelys Taloudellinen Koelaitos, Tieteelisiä Julkaisuja*, no. 23, 38 pp., 4 figs. (With a Summary in German.) (Abstract in *Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxvi, no. 22–24, p. 580. Jena, 8th April 1926.)

Examination of currant bushes, chiefly *Ribes nigrum*, in 294 localities in Finland, showed that 21 per cent., in 69 localities, were attacked by *Eriophyes ribis*, Nal. The infestation is more severe in cultivated currants than in those growing wild. Measures against the importation and transport of infested bushes are outlined.

KOTTE (W.). **Die Beurteilung der Wirksamkeit von Heu- und Sauerwurm-Bekämpfungsmitteln. Ein Beitrag zur Methodik der Schädlingsmittelprüfung.** [The Determination of the Efficiency of Preparations used against the Spring and Summer Generations of the Vine Moths. A Contribution to the Methods of testing Insecticides.]—*Weinbau u. Kellerwirtsch.*, v, pp. 1–5, 1926. (Abstract in *Centralbl. Bakt., Paras. Infekt.*, IIte Abt., lxvi, no. 22–24, pp. 582–583. Jena, 8th April 1926.)

The best method of determining the efficiency of an insecticide against the spring and summer generations of the vine-moths [*Clysia ambiguella* and *Polychrosis botrana*] consists in calculating the mortality from the number of living caterpillars found on as many stocks or bunches as possible. Not less than 100 stocks should be taken, and they must be evenly distributed throughout the experimental plots. The vineyard must contain as many control plots as possible, because infestation is very irregular throughout a given area.

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst,* Beilage no. 6, pp. 97–116. Berlin, 1st April 1926.

Preceding issues have been noticed [*R.A.E.*, A, xiv, 33, etc.]. This part includes local regulations at Oppeln (Prussian Silesia) against the woolly aphis [*Eriosoma lanigerum*] and at Stade (Hanover) against the apple leaf-sucker [*Psylla mali*], the regulations in Denmark of December 1925 on the importation of plants, and similar ones of November 1925 in Ecuador.

BLUNCK (H.) & MUNKELT (W.). **Massenauftreten der gelben Halmfliege in Schleswig-Holstein.** [An Outbreak of *Chlorops taeniopus* in Schleswig-Holstein.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst,* vi, no. 4, pp. 27–28, 1 chart. Berlin, April 1926.

The gout-fly, *Chlorops taeniopus,* Mg. (*pumilionis,* Bjerk.) has occurred in Germany at irregular intervals such as 1864, 1869, 1910 and 1922. In 1925 it occurred in various places, including Schleswig-Holstein, where these observations were made. When the work was begun in summer the characteristic injury was well developed on summer barley and, in some places, on summer wheat ; oats, winter barley and winter wheat were almost untouched. Early-sown fields were also less infested, but quickly maturing varieties appeared to give a better result than slower ones only if sown at the same date or earlier. These phenomena are due to the habits of the fly. The females on the wing in May appear to oviposit on late plants on which the larvae can complete development before the ear emerges from the leaf-sheath. Larval development was over by early July ; by 19th July the stragglers had transformed into puparia. The first adults emerged in the laboratory on 18th July and in the field on 20th–21st. The adults reached their maximum abundance on 30th July and then decreased rapidly until the last were taken on 29th August in the field, a few males still surviving in the laboratory up to 3rd September. The summer flight of the flies was incommensurate, both as regards numbers and duration, with the severity of the preceding infestation. This was probably due to the unusually stormy weather in August and to the action of parasites. Of the pupae collected 84·5 per cent. were parasitised by the Braconid, *Coelinius niger,* Nees, which was attacked by two hyperparasites, *Stenomalus* sp. and *Cyrtogaster vulgaris,* Wlk. Owing to this mortality the winter crops appeared to be free from infestation, though it was not possible to ascertain to what extent the fly was present in wild grasses. It is in a cold year with a delayed sequence of the seasons that an outbreak of *C. taeniopus* may be expected, and if the cold weather is followed by a dry May and a fine August, the conditions are highly favourable to this pest.

DYCKERHOFF (—). **Ergebnisse der Forschungen über die Rübenblattwanze und verwandte Arten der Gattung** *Piesma* **aus dem Jahre 1925.** [Results of Investigations in 1925 on the Beet Leaf Bug and related Species of the Genus *Zosmenus.*]—*Nachrichtenbl. deutschen Pflanzenschutzdienst,* vi, no. 4, pp. 29–31. Berlin, April 1926.

As a result of previous work on the beet leaf bug, *Zosmenus* (*Piesma*) *quadratus* [*R.A.E.*, A, xii, 288, 438] the winter of 1924–25 was used to ascertain the place of hibernation; this is of practical importance, as it fixes the position of the protective belt advocated where beet-fields adjoin uncultivated land. No bugs were found in the open fields or on their edges, nor inside woods, but they occurred in numbers on the edges of woods, ditches, banks, etc., and also on the ground beneath fruit-trees lining roads. They occurred in the soil down to a depth of 6 inches. Migration from these winter quarters was noticed in April after a lengthy cold period had been followed by a spell of several days in which the maximum shade temperature was 15–16° C. [59°–60·8° F.]. At first the bugs remained on *Atriplex* near their winter quarters, but as soon as the beet began to grow, *Atriplex* was almost completely abandoned in its favour. This migration to beet is made on the wing. The average number of eggs per female is 145. Some of the larvae produced adults that oviposited in the summer, thus giving rise to a partial second generation. While a few bugs suffice to produce the typical appearance of injury, lasting damage to the plants seems due only to attacks in certain spots, perhaps in the heart. This would explain the occurrence of apparently immune plants in severely injured fields. It is therefore important to prevent the pest from reaching the beet plants, and this is ensured by protective belts between the fields and the winter quarters of the insects and by destroying the bugs that collect in them. Such belts should be sown as early as possible in the vicinity of the winter quarters, and the destruction of the bugs must take place when they have begun to oviposit.

Examination of the various species found showed that *Z.* (*P.*) *anticus* is a short-winged form of *Z. capitatus* and not of *Z. maculatus*, but neither of these is harmful to beet, being found only on *Atriplex*.

Růžička (J.). **Einige Bemerkungen über die Nonnenbekämpfung auf biologischen Wege.** [Some Remarks on the biological Control of the Nun Moth.]—*Forstwiss. Zentralbl.*, xlvii, pp. 537–538, 1925. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1926, no. 1, p. 15. Vienna, 1926.)

Climatic factors play the chief part in outbreaks of the nun moth [*Lymantria monacha*]. A dry, hot spring favours the insect, while damp, cold air encourages polyhedral disease. The Chlamydozoa hibernate in the polyhedral bodies, but during the larval period they live in the larvae. It is not known how they escape from the polyhedral bodies. They do not enter the larvae by the mouth, but the polyhedral bodies are probably disintegrated in the forest litter and the Chlamydozoa thus freed enter the larvae through the spiracles.

Frolowa (S.). **Die Ei- und Samenreife bei** *Chermes strobilobius* **und** *Chermes pectinata.*—*Zeitschr. Zell. Gewebel.*, i, pp. 29–56, 26 figs., 1924. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1926, no. 1, p. 17. Vienna, 1926.)

Both *Chermes strobilobius* and *C. pectinatae* have a two-year life-cycle. The larva of the true stem-mother hibernates in spruce buds and attains sexual maturity in spring. Oviposition and development occur in a gall, from which in June there emerge the nymphs that become winged migrants. *C. strobilobius* flies to larch and *C. pectinatae* to silver fir [*Abies pectinata*]; oviposition and hibernation in bark tracks occur on these trees. In spring the false stem-mothers are formed. These produce two forms of larvae, one developing into winged sexuparae that migrate to spruce, and the other into apterous egg-laying individuals. The former lay eggs that give rise to male and female sexuales, and the fertilised females deposit eggs yielding larvae that develop in the following spring into true stem-mothers, thus completing the cycle. The latter remain on the intermediate food-plant. They are exules producing several generations in summer, from which sexuparae may again be produced in spring.

Gasow (H.). **Beitrag zur Kenntnis des Kieferngallenwicklers** (*Evetria resinella* **L.**) **und des Kiefernknospentriebwicklers** (*Evetria buoliana* **Schiff.**). [A Contribution to the Knowledge of Pine Gall Moth, *Rhyacionia resinella*, and of the Pine Shoot Moth, *R. buoliana*.]—*Allg. Forst- und Jagdzeitg.*, ci, pp. 213–220, 1 fig., 1925. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1926, no. 1, p. 19. Vienna, 1926.)

Rhyacionia (*Evetria*) *buoliana* prefers young pines, but *R.* (*E.*) *resinella* also attacks older ones. *R. buoliana* is the more destructive of the two as its caterpillar attacks several buds, and contact-poisons are necessary against it.

Petith (—). **Massenvermehrung von Forstchädlingen und vermutliche Ursachen.** [The Mass Increase of Forest Pests and the Supposed Causes for it.]—*Allg. Forst- u. Jagdzeitg.*, ci, pp. 444–446, 1925. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1926, no. 1, pp. 20–21. Vienna, 1926.)

An outbreak is recorded of the weevil, *Strophosomus capitatus*, DeG. (*obesus*, Marsh.) in an oak forest in spring, the swelling buds being eaten at the tips and the previous year's shoots being peeled. The oaks suffered severely, but other deciduous trees and the conifers remained unaffected.

Tortrix viridana, L., defoliated oaks, and *Stilpnotia* (*Liparis*) *salicis*, L., poplars.

Demme (—). **Ein neues Betätigungsfeld des grossen Waldgärtners** (*Blastophagus piniperda*). [A new Field of Activity of *Myelophilus piniperda*.]—*Forstarchiv*, i, p. 104. 1925. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenschutzes*, 1926, no. 1, p. 16. Vienna, 1926.)

Myelophilus (*Blastophagus*) *piniperda* has been observed in Germany to mine the ends of the shoots of young fir, a food-plant hitherto unrecorded for this beetle.

Brandt (—). **Der grosse und kleine Waldgärtner.** [*Myelophilus piniperda* and *M. minor*.]—*Forstl. Wochenschr. Silva*, xiii, pp. 167–171, 1925. (Abstract in *Neuheiten auf d. Gebiete d. Pflanzenchutzes*, 1926, no. 1, p. 21. Vienna, 1926.)

It is suggested that all measures directed against *Myelophilus iniperda* and *M. minor* are useless, as these beetles are never primary ests. Correct cultivation will ensure vigorous trees in which the ow of resin will kill any beetles under natural conditions.

GODBERSEN (—). **Der grosse und der kleine Waldgärtner.** [*M. piniperda* and *M. minor.*]—*Forstl. Wochenschr. Silva,* xiii, pp. 214–215, 1925.

ROESSLER (—). **Kampf den Schädlingen.** [Combat the Pests.] *Ibidem,* p. 239. (Abstracts in *Neuheiten auf d. Gebiete des Pflanzenchutzes,* 1926, no. 1, p. 23. Vienna, 1926.)

Referring to the preceding paper the first author maintains that *Myelophilus piniperda* and *M. minor* do attack healthy trees after they have suffered from infestations of Lepidoptera. The second author barks all felled pines in order to prevent an increase of the beetles after such infestations. In the case of *Pissodes notatus,* which appears in numbers only after a severe epidemic of needle-shedding disease, the majority of the trees are killed. The remainder recover in the following year, and the weevil disappears of itself.

[SPESIVTZEV (P.).] SPESSIVTSEFF (P.). **Ein neuer paläarktischer Fichtenborkenkäfer,** *Pityophthorus morosovi* **n. sp.** [A new palaearctic Spruce Bark-beetle, *P. morosovi.*]—*Ent. Tidskr.,* xlvii, no. 1, pp. 48–50, 1 fig. Stockholm, 1926.

Pityophthorus morosovi, sp. n., is described from the upper branches of 80–100 year-old spruce growing in almost unmixed stands in Central Russia.

BENGTSSON (S.). **Braconologische Notizen. II. Zur Kenntnis der Schmarotzer der Rübenfliege** (*Pegomyia hyoscyami* **Panz.**). [Braconological Notes. II. On the Parasites of the Beet Fly, *P. hyoscyami.*]—*Ent. Tidskr.,* xlvii, no. 1, pp. 51–64, 2 figs. Stockholm, 1926.

The beet fly, *Pegomyia hyoscyami,* Panz., has recently become a serious pest in northern Europe.

The Chalcid, *Trichogramma evanescens,* Westw., appears to be its only egg-parasite, and is the one species of practical importance in checking it in Sweden. Several larval parasites have been mentioned in the literature, including an Ichneumonid, *Phygadeuon fumator,* Grav., and a number of Braconids, chiefly *Opius* spp. Examination of Braconids collected in 1924–1925 in Sweden and Pomerania resulted in the list of parasites of *P. hyoscyami* being increased by about 10 species, of which 6 are new. The German species are *Opius carbonarius,* Nees, *O. fulvicollis,* Thoms., *O. nitidulator,* Nees, *O. ruficeps,* Wesm., *O. spinaciae,* Thoms., *Diachasma bremeri,* sp. n., and *Alysia divergens,* sp. n. The Swedish species are *O. carbonarius, O. fulvicollis, O. nitidulator, O. spinaciae, O. procerus,* Wesm., *O. sylvaticus,* Hal., *O. betae,* sp. n., *Aspilota betae,* sp. n., *A. kemneri,* sp. n., and *Microgaster carinatus,* sp. n. No hyperparasites of *P. hyoscyami* are known in Sweden. Of the Braconids, *O. nitidulator* only has occurred in considerable numbers in Sweden, while, according to Bremer, *O. fulvicollis* is the most important species in Pomerania.

In 1924, *O. spinaciae* and *Diachasma bremeri* predominated in Central Germany.

BLUNCK (H.) & MERKENSCHLAGER (F.). **Zur Oekologie der Drahtwurmherde.** [A Contribution to the Ecology of Wireworm Foci.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, v, no. 12, pp. 95–98, 2 figs. Berlin, December 1925. [Recd. April 1926.]

In the course of soil analyses from fields infested with wireworms (*Agriotes*) in Germany, it was found that the feature common to all cases was that the larvae assembled in places where the soil had the lowest percentage of alkalis or other bases, and that even a marked degree of acidity in the soil did not repel them.

TRAPMANN (W.). **Vergleichende Messung der Benetzungsfähigkeit von Spritzlösungen.** [The Comparative Measurement of the Wetting Power of Spray Solutions.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, v, no. 12, pp. 98–100, 1 fig. Berlin, December 1925. [Recd. April 1926.]

The subject of this paper is substantially the same as that of one already noticed [*R.A.E.*, A, xiv, 193].

MOLL (F.). **Insekten als Zerstörer von Masten für Starkstrom und für Telegraphie.** [Insects as Destroyers of Electric Power Cable and Telegraph Posts.]—*Anz. Schadlingsk.*, ii, no. 4, pp. 39–42, 6 figs. Berlin, 15th April 1926.

Further details are given on the destruction of electric-power-cable posts by the Cerambycid, *Hylotrupes* (*Callidium*) *bajulus* [*R.A.E.*, A, xiv, 98]. Both spruce and pine posts are attacked, but always near villages, and the infestations are so localised as to be of little economic importance. Other Coleoptera that attack posts are *Ergates faber*, the adults of which are in flight in June and July and oviposit in cracks in thoroughly dry wood; *Acanthocinus aedilis*, of which an attack was observed in a post that had not been treated with a preservative; *Asemum striatum*; and *Xyloterus* (*Tomicus*) *lineatus*, which attacks telegraph posts stacked in timber yards. None of these pests, however, are of importance.

SEIFF (W.). **Die Wirkung des Aetzkalkes auf Kiefernspannerpuppen.** [The Action of Caustic Lime on the Pupae of the Pine Moth.] —*Anz. Schadlingsk.*, ii, no. 4, pp. 43–44. Berlin, 15th April 1926.

In view of the great increase of the pine moth, *Bupalus piniarius*, L., in Germany in 1925, an investigation was made on the effect of caustic lime on the pupae, which hibernate in the forest litter, but it was found useless in practice, even if very large quantities were employed.

MOLL (F.). **Pelzkonservierung und Vacuum.** [Vacuum and the Storage of Furs.]—*Anz. Schadlingsk.*, ii, no. 4, pp. 48–49, 1 fig. Berlin, 15th April 1926.

With reference to a notice on the storage of furs in a vacuum as a protection from clothes moths and other insects [*R.A.E.*, A, xiv, 100], it is pointed out that suitable apparatus was patented and manufactured in Germany several years ago, and that the firms concerned have found that a vacuum alone is insufficient in practice and that it must be combined with heating to 40°–50° C. [104°–122° F.].

MANZEK (—). **Massenauftreten von Insekten.** [Mass Occurrence of Insects.]—*Ent. Bl.*, xxii, no. 1, pp. 44–45. Berlin, 31st March 1926.

Some hundreds of bags of rice meal, imported from India and stored at Magdeburg, were found to be swarming with *Tribolium navale*, F. It is uncertain whether the infestation had started in India or in Hamburg.

Jahresheft 1923 des Phänologischen Reichsdienstes. [Report for 1923 of the Imperial Phenological Service.]—*Mitt. biol. Reichsanst. Land- u. Forstw.*, no. 27, 224 pp. Berlin, April 1926.

This report follows the lines of the previous one [*R.A.E.*, A, xiii, 165].

SCHEIDTER (F.). **Forstentomologische Beitrage. 4-7.** [Contributions to Forest Entomology. 4–7.]—*Zeitschr. Pflanzenkr.*, xxxvi, no. 5–6, pp. 146–162. Stuttgart, 1926.

The eggs of the sawfly, *Acantholyda* (*Lyda*) *stellata*, Christ, from pine-woods in Franconia, were parasitised to the extent of 87–98 per cent. by *Trichogramma evanescens*, Westw. (*piniperdae*, Wolff), which had probably passed to the sawfly following an outbreak of the pine-moth [*Panolis flammea*, Schiff.], the eggs of which it is known to infest. Only a few adults emerged in the same summer, the majority of the larvae remaining in the eggs of the host until the following spring. A few eggs were found to contain another parasite, which proved to be the Ichneumonid, *Closterocerus ovulorum*, Rtz. Only one larva of this species was found in each egg, either alone or together with larvae of *T. evanescens*, on which it was found to feed.

The Cerambycid, *Plagionotus* (*Clytus*) *arcuatus*, L., seems to be distributed throughout the Rhine Palatinate and to be more or less abundant wherever oaks occur. Oviposition begins in May. At the end of August the majority of the larvae are boring into the wood. From oak billets kept in a warm room adults emerged in the following March, so that this beetle appears to have one generation a year. It is a secondary pest that chiefly attacks felled trees, standing trees being only infested on rare occasions. The measures advocated are the removal of felled timber before oviposition begins at the end of April. Trees may be felled about July, after oviposition is completed, and may then be left lying until the following April, or they may be barked in summer just before the larvae begin boring into the wood.

When the adult females of *Melolontha melolontha*, L. (*vulgaris*, F.) emerge from the ground at the end of April or early in May there are usually 5 immature eggs in each of the 6 egg-tubes normally found in each of the ovaries. Mating occurs a few days after emergence, but the maturation of the eggs is slow, about 3 weeks elapsing before the first eggs are ready for deposition. A second series of eggs matures somewhat more rapidly than the first, each series averaging 24–30 eggs. Oviposition a third time is exceptional, and there appear to be 3–5 immature eggs left that are not laid. The great increase of these beetles in spite of the comparatively small number of eggs is probably due to the fact that all stages except the adult are well protected against enemies.

The female of *Tortrix viridana*, L., emerges from pupation with a number of mature eggs that are deposited after mating. They are laid over a period of 10–14 days.

EIDMANN (H.). **Beobachtungen an parasitierten Kiefernspannerraupen.** [Observations on parasitised Larvae of *Bupalus piniarius*.]—*Forstwiss. Centralbl.*, xlvii, pp. 357–369, 17 figs., 1925. (Abstract in *Zeitschr. Pflanzenkr.*, xxxvi, no. 5–6, p. 181. Stuttgart, 1926.)

Large numbers of the larvae of *Bupalus piniarius*, L., collected in Bavaria in the winter of 1924–1925 were parasitised by *Ichneumon nigritarius*, Grav. Such larvae become inactive in February–March, and when the parasite is in the pupal stage, they are quite opaque.

KLÖCK (—). **Zur Lösung der Nonnenbekämpfungsfrage auf biologischem Wege.** [A Contribution to the Solution of the Question of Combating the Nun Moth biologically.]—*Forstwiss. Centralbl.*, xlvii, pp. 241–245, 1925. (Abstract in *Zeitschr. Pflanzenkr.*, xxxvi, no. 5–6, pp. 183–184. Stuttgart, 1926.)

The introduction of forest litter infected with polyhedral bodies resulted in an outbreak of the polyhedral disease among the larvae of the nun moth [*Lymantria monacha*] infesting a Bavarian forest. Foci of infection require to be established artificially. In these, weakened larvae are first exposed to the disease, and when it has attained sufficient virulence to attack healthy larvae, it can infect the thousands of individuals on entire tree crowns, resulting in a further great increase of virulence.

WOLFF (M.) & KRAUSSE (A.). **Der Nachweis der Calciumarsenatwirkung gegen Nonne.** [The Proof of the Effect of Calcium Arsenate against the Nun Moth.]—*Forstarchiv*, 1925, pp. 104–105, 1 fig. (Abstract in *Zeitschr. Pflanzenkr.*, xxxvi, no. 5–6, p. 186. Stuttgart, 1926.)

Before applying calcium arsenate, 425 cc. of excreta of the nun moth [*Lymantria monacha*] were collected in 24 hours on a surface of 9·05 square metres. Three days after the application only 5 cc. were collected.

WÜLKER (G.). **Ueber die Verwendung von Arsenmitteln im Forstschutz.** [The Use of Arsenicals in Forest Protection.]—*Silva*, xiii, no. 25, 1925, pp. 193–195. (Abstract in *Zeitschr. Pflanzenkr.*, xxxvi, no. 5–6, p. 191. Stuttgart, 1926.)

The subject matter of this paper is substantially the same as that of one already noticed [*R.A.E.*, A, xiii, 63]. In dusting trap logs with arsenicals against *Hylobius abietis* it must be remembered that the logs lose their attractiveness in 2–3 weeks. *Phyllobius* spp. and *Otiorrhynchus* spp. can be dealt with in the same way. For controlling sawflies such as *Lygaeonematus pini*, the trees must be dusted at a height of 15 ft., with 17–22 lb. of dust per acre. As the effect disappears after 2 weeks, the application must be repeated once or twice.

Pests of Cultivated Plants in Czechoslovakia during the Months of April-September 1925. [*In Czech.*]—*Československého Zemědělce*, vii, pt. 47, reprint 4 pp. Prague, 1925. [Recd. May 1926.]

This list includes many insects and shows the local distribution, the plant attacked, and the severity of the injury.

Krasucki (A.). **Weevils (Sitonini) in S.E. Poland.** [*In Polish.*]—*Choroby i Szkodniki Roślin*, i, no. 1, pp. 11–18, 1 fig., 9 refs. Warsaw, 1925. (With a Summary in French.) [Recd. April 1926.]

During 1921–23 considerable damage was caused by *Sitona lineata*, L., in south-eastern Poland. Beans, vetches and peas were attacked, the latter suffering most injury. *S. crinita*, Hbst., also occurred, but was less abundant. The larvae of *S. lineata* penetrated to the interior of the roots. The seasonal history of this weevil as observed during the three years is discussed. From all larvae and pupae collected in the autumn adults emerged the same year. Contrary to statements by English authors, no larvae or pupae have been found hibernating in the ground, the winter being passed in the adult stage in uncultivated fields.

During September *S. sulcifrons*, Thunb. (exclusively) occurred in clover fields, but was not found in company with *S. lineata*.

In protecting plants from attack, rapid growth should be encouraged and all weeds and rubbish cleared away.

Prüffer (J.). **Contribution to the Knowledge of** *Eriosoma (Schizoneura) lanigerum*, **Hausm., in Poland.** [*In Polish.*]—*Choroby i Szkodniki Roślin*, i, no. 1, pp. 19–22, 2 refs. Warsaw, 1925. (With a Summary in French.) [Recd. April 1926.]

In Little Poland *Eriosoma lanigerum*, Hausm., occurs on the higher ground and is considerably less numerous at the foot of the hills. It occasionally occurs on pear as well as apple. Winged forms were noticed on the 19th October on old apple trees.

Krasucki (A.). **Agricultural Pests in Little Poland and the Protection of Plants.** [*In Polish.*]—*Choroby i Szkodniki Roślin*, i, no. 1, pp. 23–31. Warsaw, 1925. (With a Summary in French.) [Recd. April 1926.]

The insect pests recorded during 1921–24 include: *Chlorops taeniopus*, Meig., *Oscinella (Oscinis) frit*, L., *Cephus pygmaeus*, L., *Macrosiphum granarium*, Kirby (*Siphonophora cerealis*, Kalt.), *Sitona lineata*, L., *Cicadula sexnotata*, Fall., *Loxostege (Phlyctaenodes) sticticalis*, L., *Phytometra (Plusia) gamma*, L. (largely controlled by the fungus *Tarichium* sp.), *Hyponomeuta malinellus*, Zell., *Anthonomus pomorum*, L., *Aphis rumicis*, L., *A. pomi*, DeG. (*mali*, F.), *Myzus cerasi*, F., *Lecanium corni*, Bch., *Lepidosaphes ulmi*, Fern., *Eriosoma (Schizoneura) lanigerum*, Hausm., and *Melolontha melolontha*, L. (*vulgaris*, F.).

KRASUCKI (A.). *Phytometra* (*Plusia*) *gamma*, **L., a Pest of Cultivated Plants and its Mass Occurrence in 1922.** [*In Polish.*]—*Choroby i Szkodniki Roślin*, i, no. 3, pp. 1–11, 15 refs. Warsaw, 1925. (With a Summary in German.) [Recd. April 1926.]

A general account is given of *Phytometra gamma*, L., with special reference to Little Poland and the outbreak in 1922, when sugar-beet was severely damaged. The larvae were rapidly destroyed by the fungus *Tarichium*. Many were also killed by birds and the Tachinid, *Phryxe vulgaris*, Mg.

MOKRZECKI (Z.). **L'Entomologie au XII Congrès International d'Agriculture à Varsovie.** [*In Polish.*]—*Choroby i Szkodniki Roślin*, i, no. 3, pp. 34–38. Warsaw, 1925. (With a Summary in French.) [Recd. April 1926.]

In a paper entitled " International Organisation for the Control of Plant Pests and Diseases and its Application," the author discussed existing organisations and pointed out the necessity of founding a Central Bureau of Entomophytopathology in Poland similar to the Bureau of Entomology at Washington. In discussing international legislation, it was pointed out that certain countries had forbidden the importation of potatoes from Poland owing to the existence there of black gall (*Synchytrium endobioticum*) and *Leptinotarsa decemlineata*, whereas *L. decemlineata* has not yet been found in Poland.

KRASUCKI (A.). *Eriosoma* (*Schizoneura*) *lanigerum*, **Hausm., in South-east Poland.** [*In Polish.*]—*Choroby i Szkodniki Roślin*, i (1925), no. 4, pp. 22–30, 7 refs. Warsaw, 1926. (With a Summary in German.)

Eriosoma lanigerum, Hausm., was probably first introduced into South Poland about 1901 with apple trees. Though of considerable importance wherever it occurs in sufficient numbers, its distribution is greatly limited by climatic conditions, particularly temperature. It is seldom met with in the exposed orchards of the countryside, though occurring in abundance in the shelter of towns. The importation of *Aphelinus mali*, Hald., from France and experiments with parasitic fungi are recommended.

SIMM (K.). **A List of the more important Animal Pests of Plants as observed by the Silesian Plant Protection Station during 1925.** [*In Polish.*]—*Choroby i Szkodniki Roślin*, i (1925), no. 4, pp. 36–42. Warsaw, 1926. (With a Summary in German.)

The insect pests recorded include : Forest pests, *Acantholyda* (*Lyda*) *stellata*, Christ, *Lymantria monacha*, L., and *Aradus cinnamomeus*, Panz. ; orchard pests, *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., *Myzus* (*Aphis*) *cerasi*, F., *Lecanium* (*Physokermes*) *coryli*, Ldgr., and *Anthonomus pomorum*, L. ; field pests, *Chlorops taeniopus*, Meig., and *C. lineata*, F., causing considerable injury to wheat, the wireworms, *Lacon murinus*, L., and *Agriotes segetum*, Bjerk., *Cephus pygmaeus*, L., and millepedes of the genus *Geophilus*. The Tettigoniid, *Tachycines asynamorus*, Adel., occurs in hot-houses, probably having been imported with ornamental plants from Belgium or Holland.

Garbowski (L.). **Les maladies et les parasites animaux des plantes cultivées dans l'ouest de la Pologne en 1923.** [*In Polish.*]—Supplement to *Choroby i Szkodniki Roślin*, i, no. 2, 39 pp. Warsaw, 1925. (With a Summary in French.) [Recd. April 1926.]

The insect pests recorded are *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., causing considerable injury to fruit trees, and against which oil and soap emulsions are being used; *Pieris brassicae*, L., attacking cabbages; *Pteronus ribesii*, Scop. (*Nematus ventricosus*, Klg.), attacking bush fruits, and controlled by a 0·15 per cent. solution of Paris green mixed with three times the amount of lime; and *Aphis rumicis*, L. (*papaveris*, F.), attacking beet, peas, beans and vetch.

Mokrzecki (Z.). **The Control of Pests with the Aid of Aeroplanes and Fumigating Candles.** [*In Polish.*]—*Polsk. Pismo ent.*, iv (1925), pt. 4, pp. 253–256, 3 figs. Lwow, 1926. (With a Summary in German.)

The contents of this paper on measures against *Lymantria* (*Liparis*) *monacha*, L., have already been noticed from another source [*R.A.E.*, A, xiv, 197].

[Rakhmaninov (A. N.).] **Рахманинов (А. Н.). On the Autumn Injury by the Hessian Fly.** [*In Russian.*]—Kharkovsk. Oblastn. S.-Kh. Opuitn. Stantz. [*Kharkov Region. Agric. Expt. Sta.*], Ent. Dept. no. 2, 51 pp., 1 pl., 5 refs. Kharkov, 1925. [Recd. April 1926.]

From observations made during 1922–1924 it is evident that the injury caused to winter crops by the Hessian fly [*Mayetiola destructor*, Say] in the autumn does not necessarily destroy the crop. The resistance of the plants depends on the state of their development, which may be regulated by cultural practices such as time of clean fallow, time and density of sowing, etc.

[Ozhiganov (I.).] **Ожиганов (И.). On the Control of Pests of Orchards and Vegetables.** [*In Russian.*]—63 pp., 23 figs. Kharkov, Publ. "Proletariĭ." Price *kop.* 55. 1925. [Recd. April 1926.]

An account is given of the various pests and a special chapter is devoted to the preparation of the insecticides, etc., recommended.

[Mogilyanskiĭ (N. K.).] **Могилянский (Н. К.). *Phylloxera* and its Control.** [*In Russian.*]—22 pp., 5 figs. Kharkov, 1925. [Recd. April 1926.]

This is a detailed account of the life-history and control of *Phylloxera*, the history of its distribution, and its natural enemies, compiled from the work of other authors.

[Golovyanko (Z.).] **Головянко (З.). On the Pre-anal Bristles of the Larvae of** *Polyphylla fullo*, **L.** [*In Russian.*]—Vestnik Plodovodstva, Vinogradarstva i Ogorodnichestva [*Herald of Horticulture & Viticulture*], 1925, no. 12, pp. 552–556, 16 figs., 3 refs. [Kharkov] December 1925. [Recd. April 1926.]

The pre-anal bristles of the larvae of *Polyphylla fullo*, L., are discussed as a means of distinguishing them from other larvae occurring in soil of vineyards.

[Bertenson (V.).] **Бертенсон (В.).** *Phylloxera* **in Ukraine. Historical Review.** [*In Russian.*]—Vestnik Plodovodstva, Vinogradarstva i Ogorodnichestva [*Herald of Horticulture & Viticulture*], 1925, no. 12, pp. 558–562, 7 refs. [Kharkov] December 1925. [Recd. April 1926.]

The records of the occurrence of *Phylloxera* in the Ukraine since 1883 are reviewed. It is considered that existing infested vineyards cannot be saved and that in the future it will only be possible to cultivate vines on sandy soil or on resistant stocks.

[Klodnitskiĭ (I. I.).] **Клодницкий (И. И.). New Data on the Alternation of Generations in Aphids.** [*In Russian.*]—*Bull. Inst. scient. Leschaft*, iv, pp. 285–296. Petersburg, 1921.

In observations on the life-history of several species of Aphids in the neighbourhood of Kiev, over a period of three years, it was found that the appearance of the sexual generation was not dependent on lower temperatures, neither had it any connection with the quantity of food. Possibly the life-cycles in Aphids are hereditary, though liable to some adaptation to the conditions of existence.

Willcocks (F. C.). **The Insect and related Pests of Egypt. ii. Insects and Mites feeding on Gramineous Crops and Products in the Field, Granary and Mill.**—*Sultanic Agric. Soc.*, xii+418 pp., 20 pls., 92 figs. Cairo, 1925. [Recd. April 1926.]

This important contribution to the study of insects injurious to cereals and other graminaceous crops in Egypt consists of sections dealing with the insect pests of wheat and barley, maize, millets, sugar-cane and rice, and those found in granaries and mills. A detailed account is given of the development and habits of each pest and of the nature and importance of the damage caused by it.

A previous volume, dealing with *Platyedra gossypiella*, has already appeared [*R.A.E.*, A, vii, 162].

Mason (T. G.) & Wright (C. H.). **A Survey of Factors Affecting the Development of the Cotton Plant in the Oyo and Abeokuta Provinces of Southern Nigeria.**—*Nigeria: 4th Ann. Bull. Agric. Dept.*, pp. 3-31, 3 charts, 10 refs. Lagos, 1st August 1925. [Recd. April 1926.]

This survey was on the lines of a previous one [*R.A.E.*, A, xiii, 169]. The authors consider that insect damage is probably not an important factor in limiting the introduction of American cotton, and there is no significant difference in its yield compared with that of native cotton. The latter is more severely affected by *Helopeltis* than the

American, and only slightly less seriously damaged by bollworms. American cotton does, however, suffer much more severely from cotton-stainers (*Dysdercus*) and the associated boll rots. Direct damage to bolls by insects is probably not responsible for excessive boll shedding, but damage to the plant body by *Helopeltis* may cause some indirectly. A high rate of boll shedding does not, however, in itself, involve any great loss of crop.

Laycock (T.). **Preliminary Investigations of the Parasitism of certain Fungi causing Boll Rots of Cotton.**—*Nigeria: 4th Ann. Bull. Agric. Dept.*, pp. 32-49, 6 refs. Lagos, 1st August 1925. [Recd. April 1926.]

Internal boll disease of cotton in Nigeria, caused by a fungus corresponding to W. Nowell's type C (unidentified), has already been shown to be introduced into the bolls by the cotton-stainers, *Dysdercus superstitiosus*, F., and other species [*R.A.E.*, A, xiii, 169]. Further confirmation of this fact was obtained by experiments in which bolls protected by bags were subjected to the attacks of cotton-stainers either taken in the field or bred under sterile conditions, while others were left as controls; the disease appeared only in those bolls that were subjected to the attacks of cotton-stainers captured in the field. These experiments enabled a comparison to be made between the injury actually caused by the cotton-stainers and that caused by the fungus introduced by them; the former consists of well-defined, localised, patches of brown lint, sometimes only adjacent to the injured, shrivelled seeds; the latter consists of a diffused light yellow stain, affecting usually the greater part of the lint, and starting from a dark patch at the point of puncture. Artificial infection with the fungus appears to depend on the puncturing of a seed with the needle; infection was readily obtained by introducing cotton-stainers bred under sterile conditions to bolls smeared with a culture of the fungus. To determine the progress of fungus infection after attack by cotton-stainers, specimens taken in the field were introduced to healthy, screened bolls for two days; three days after their removal, punctured seeds had small brown spots and the lint in contact with them was slightly stained; on the next day fungus hyphae were present; and after a further two days fungus spores were plentiful. Attempts to isolate the fungus from cotton-stainers have so far failed. No host-plants of the fungus other than cotton have been found.

Anthracnose boll rot, caused by the fungus, *Glomerella* (*Colletotrichum*) *gossypii*, is a wound parasite that enters the bolls readily through the lesions made by cotton-stainers and other causes. Boll rot caused by the fungus, *Fusarium* sp., occurs on the vegetative and reproductive parts of the cotton plant; it is a saprophyte (or perhaps a wound parasite) and is favoured by damp conditions and the lesions caused by insects.

Pomeroy (A. W. J.) & Lean (O. B.). **Observations on the Extent of the Damage caused by Bollworms and Stainers to the Cotton Crop in Southern Nigeria.**—*Nigeria: 4th Ann. Bull. Agric. Dept.*, pp. 50-63, 2 charts, 3 refs. Lagos, 1st August 1925. [Recd. April 1926.]

In this paper are presented the results of daily examinations of flowers open, buds shed, and bolls shed on plots of American cotton

(*Gossypium hirsutum*) and a Nigerian native cotton (*Gossypium peruvianum*), in three types of country and climate, the typical forest belt, the drier savannah, and the intermediate type at Ibadan, where the plots were in the middle of an area of 9 square miles in which all standing cotton is uprooted before the end of April and from which all silk-cotton trees (*Eriodendron* and *Bombax* spp.) have been removed. In counting the shed bolls they were classified in three groups, those showing injury by bollworms, by Heteroptera (mainly cotton-stainers, *Dysdercus* spp.) and by neither of these groups of insects; bolls showing both types of insect injury were divided equally between the two groups. The shed buds were classified in two groups, those showing bollworm injury, and others.

Bud shedding appears to have little effect on the number of flowers produced and the ultimate crop of cotton. In each of the three zones the percentage of shed buds showing bollworm injury was much greater on the American than on the native cotton.

The number of bolls shed, at least by the American cotton, did not bear any relation to the observed degree of infestation by cotton-stainers or bollworms through the season, and it is concluded that the number of shed bolls showing insect injury is dependent on the total number of bolls shed, and that this number is dependent on physiological causes, as it remained throughout the season a fairly constant percentage of the number of recently formed bolls.

The number of bolls shed by the native cotton was far less than by American cotton, and it is thought that insects are probably the primary cause of some boll shedding on this cotton.

Boll counts made after the period of maximum shedding indicated that a sufficient number of bolls remained to yield a crop far in excess of that actually harvested, and it was obvious that an examination of these was necessary to determine the essential insect factors responsible for loss of crop. The main conclusions drawn from an analysis of bolls remaining on the plants have already been noticed [*R.A.E.*, A, xiv, 97].

The proportion of stained to clean lint was greater on plots sown on 15th June and 5th September than on plots sown at the end of July, and was greatest on the September sown plots, in both American and native cotton.

GOLDING (F. D.). **A Statistical Survey of the Infestation of** *Dysdercus* **spp. on Cotton in Nigeria.**—*Nigeria: 4th Ann. Bull. Agric. Dept.*, pp. 64-81, 3 charts, 6 refs. Lagos, 1st August 1925. [Recd. April 1926.]

The data on which this survey was based were obtained by collecting every week all nymphs and adults of *Dysdercus* (cotton-stainers) on three sample plots of $\frac{1}{8}$ acre of each "type" of cotton in four localities. The "types" of cotton to which this system was applied were the three species, *Gossypium hirsutum* (American), *G. peruvianum* (Native, Meko), and *G. vitifolium* (Native, Ishan), sown on the 15th June, 1st and 15th July, and 5th September, and designated "early," "second early," "standard," and "late." The climate in the Northern Provinces is drier than in the Southern, and at two stations in the former *Dysdercus* was almost completely absent on account of the unfavourable conditions.

The first migrants of *Dysdercus* were observed on cotton on 8th August (on an exceptionally early experimental plot), being 6-7 weeks before the normal time [*R.A.E.*, A, xii, 67]; of the 157 migrants collected on this plot during August all but one were the type of *D. superstitiosus*, F., here designated the "banded" form, while the majority of those present on *Hibiscus sabdariffa* in July and August were of the type of *D. superstitiosus* here designated the "spotted" form. On the 2nd September, 83 per cent. of the 1,054 adult cotton-stainers collected were the banded form of *D. superstitiosus*, 13 per cent. the spotted form, and 4 per cent. *D. melanoderes*, Karsch; in the succeeding week, 1,249 were collected, the percentages being respectively 32, 56, and 12; the numbers collected in the next four weeks increased progressively, reaching a climax (4,270) in the fourth (9th-15th November), when the percentages were respectively 7, 71, and 20. It is thus seen that there were two migratory phases, first a gradual influx, mainly of the banded form of *D. superstitiosus*, and second a sudden infestation by the spotted form of *D. superstitiosus* and *D. melanoderes*.

It was found by releasing marked adult cotton-stainers that they may migrate more than a mile to cotton. According to Withycombe [*R.A.E.*, A, xii, 548] *D. howardi*, Ballou, migrates to cotton in response to an attraction by an odour emitted by the opening bolls; the author, however, believes that migration of *Dysdercus* is induced by the flowering of a large area of cotton, and that the migrants, on arriving, select the part of the crop that affords the largest supply of young bolls. In 1924 the main migration to early American cotton at Ibadan coincided with the maximum period of flowering, at which time the number of opening bolls was, by comparison, almost negligible.

From an entomological point of view the planting of contiguous plots of exotic cotton sown on different dates is an unsatisfactory method of testing the suitability of the dates, as the late sown cotton is heavily attacked by adult cotton-stainers bred on the earlier sown plots, but in the case of interposed plots of exotic and native cotton it is doubtful if this factor is of importance; although many adults and fifth instar nymphs of cotton-stainers apparently migrated to Meko cotton from interposed American cotton, this is thought to have been due to the fact that the latter was rendered less attractive owing to a severe attack by larvae of a beetle that injured the roots [*Syagrus calcaratus*, F.].

The year 1924 proved an exception to the correlation between August rainfall and yield of July sown American cotton discovered by Mason and Jones [*R.A.E.*, A, xiii, 170], as the rainfall was exceptionally high and the yield good; the author suggests that this was due to the lateness of the main migration of *Dysdercus*; he considers the relationship between the flowering of any particular plot and the date of the main migration to be of paramount importance in determining the yield of that plot.

The distribution of *Dysdercus* in a field of cotton is often irregular, and this has been ascribed to a gregarious tendency; in a sloping field containing parallel strips of early, second early, standard, and late American cotton the infestation was found in each case to be heavier at the bottom of the field than at the top, where the plants suffered somewhat from drought, and were less luxuriant.

Examination of large numbers of adult *Dysdercus* for Tachinid eggs showed that the numbers decreased from September to February, the percentage of adults bearing eggs decreasing from 15·5 to 0·5 in that period. Similarly the predacious Reduviids, *Phonoctonus* spp., which were taken frequently in September, October, and the first half of November were not found in the latter half of November or in December. The decrease in breeding activity of these parasites and predators coincided with an increase in atmospheric aridity. Tachinid activity had increased again by May. Only three nymphs of thousands examined bore Tachinid eggs. Adults of a Pyrrhocorid, *Cenaeus* sp., attacked *Dysdercus* in captivity, but it is comparatively rare and it is doubtful whether it is predacious on *Dysdercus* in nature.

GOLDING (F. D.). **Observations on** *Syagrus calcaratus*, **F., and** *Helopeltis bergrothi*, **Reut., Minor Pests of Cotton in Southern Nigeria.**—*Nigeria : 4th Ann. Bull. Agric. Dept.*, pp. 82-88, 3 refs. Lagos, 1st August 1925. [Recd. April 1926.]

Considerable damage to cotton at Ibadan was caused by the larvae of the Eumolpid beetle, *Syagrus calcaratus*, F., in 1924. From July to October the adults were numerous on both American and native cotton, feeding on the leaves, and less frequently on the petioles and stems ; in November, when the atmospheric aridity increased, they left the leaves for the bracts and calyces of the buds and bolls, where they continued to feed for a time, becoming scarce by January. The adults were also found on the leaves of *Hibiscus esculentus*, *H. sabdariffa*, *H. rosa-sinensis*, *Urena lobata*, and *Sida carpinifolia*. The larvae feed on the roots of cotton (and probably on related plants), making deep lesions in the main root and frequently decorticating the smaller roots. In severely attacked plants the leaves turn red and are shed, together with the bolls and buds. Both American cotton and native cotton were attacked, but the latter showed power of recovery. The damage was most severe on plots sown early, *viz.*, in May and June, those sown on 15th July being little damaged. A high degree of moisture in the soil was found to be necessary for the successful rearing of the larvae and pupae, and it is thought that the amount of rainfall in July and August has an important bearing on the number of larvae that survive, and consequently on the extent of the damage caused by them.

The Capsid, *Helopeltis bergrothi*, Reut., hitherto unrecognised as a cotton pest in Nigeria, has been found to be the cause of considerable damage in several places. The leaves, stem, bolls, and buds are all attacked by the nymphs and adults ; young leaves are often killed, and the terminal shoot may die as a result of damage to the main stem. The feeding punctures rarely penetrate the carpel wall to the interior of the bolls, but those on the pedicels are probably the cause of considerable bud shedding. Ishan cotton (*Gossypium vitifolium*) appears to be more susceptible to attack than American or Meko (*G. hirsutum* and *peruvianum*). *Helopeltis sanguineus*, Popp., also occurs on cotton, but is less numerous than *H. bergrothi*.

POMEROY (A. W. J.). **The Cotton Boll Worms of Southern Nigeria.**—*Nigeria : 4th Ann. Bull. Agric. Dept.*, pp. 89-108, 2 pls., 3 refs. Lagos, 1st August 1925. [Recd. April 1926.]

The bollworms are important pests of cotton in Southern Nigeria, and as there are several genera and species to which the name is applied, it was necessary to determine the relative abundance of the various species, and their life-histories, as a preliminary to the introduction of efficient control measures. Weekly collections of larvae were made from the bolls of a large number of cotton plants on several plots at Ibadan, and six species were taken, *viz.*, *Argyroploce leucotreta*, Meyr., *Diparopsis castanea*, Hmps., *Earias biplaga*, Wlk., *E. insulana*, Boisd., *Prodenia litura*, F., and *Heliothis obsoleta*, F. The prevalence of these moths on American cotton (*Gossypium hirsutum*) and Meko cotton (*G. peruvianum*) from the middle of August to the middle of February, and on plots of these cottons sown in June, July, and September, is shown in tables. *A. leucotreta* was more prevalent generally on Meko than on American cotton, 70 per cent. of the larvae from the former and 54 per cent. from the latter being of this species. The percentage of larvae *A. leucotreta* was greatest on the earlier sown plots, and the percentage of *D. castanea*, *E. biplaga*, and *E. insulana*, which are next in importance, *D. castanea* being more plentiful than the other two species combined, was greatest on the later sown plots. Damage to cotton by bollworms was considerably greater in localities in the forest belt and in the savannah country than at Ibadan, but *A. leucotreta* was rare in these areas. It is thought that the control measures carried out at Ibadan [*R.A.E.*, A, xiv, 321] must have been responsible for the comparatively small numbers of *Earias* there, and that *D. castanea*, of which cotton is the only known food-plant, must have been controlled to some extent by hoeing.

The eggs of *E. biplaga* are laid singly at night on the terminal stems, buds, and bolls of the cotton plant. Females in captivity began to lay about 3 days after emergence, and lived for about 10 days, during which time they laid an average of 51 eggs. The eggs hatch in from 3 to 6 days. The larvae eat the top of the egg shell and crawl to the nearest bud or boll, inside which they begin to feed. They moult four times, and the length of each of the five instars varies considerably, the larval stage lasting from 9 to 25 days; a larva does not usually feed in one boll for more than a few hours, and thus causes considerably more damage than a larva of *D. castanea*, which, after the third moult, usually remains in one boll until the entire contents have been eaten. The larva, when ready to pupate, spins a tough silken cocoon on the food-plant or among débris on the ground. The average length of the pupal period is 10 to 12 days, or rather longer in January, when a lower temperature coincides with atmospheric aridity. It has been found that *E. luteolaria*, Hmps., is only a form of *E. biplaga*, and that *E. citrina*, Saalm., is the male. Food-plants of *E. biplaga* other than cotton are *Hibiscus esculentus*, *H. rosa-sinensis*, *Sida carpinifolia*, and *Abutilon zanzibaricum*, the first-named being the most important. From August to October about 25 per cent. of the larvae were parasitised by Braconids, probably *Microgaster* sp. and *Urogaster* sp., but by January these parasites had disappeared. Larvae have also been found parasitised by a Nematode, and are preyed upon to a considerable extent by the Eumenid wasp, *Rhynchium ventrale*, Sauss.

The life-history of *E. insulana* is similar to that of *E. biplaga*, but the larvae appear on cotton later, and are not abundant until February, by which time the cotton crop, particularly on American cotton, is almost over. Only 12 per cent. of the *Earias* larvae taken at Ibadan in 1924-25 were *E. insulana*.

The eggs of *D. castanea* are laid at night, usually singly, on the buds, bracts, leaves, and terminal shoots of cotton, each female laying from 70 to 120. The larvae hatch in 5 or 6 days, and feed in the buds or bolls for 18 to 24 days, after which they enter the soil and construct strong earthen cells at a depth of about 5 inches, in which they pupate after 2 to 5 days. The normal duration of the pupal stage is about 20 days, but a considerable proportion of the pupae formed during January and February lie dormant for long periods, from 6 to 12 months or even longer ; this is a very important factor in ensuring the existence of the species from season to season. The normal life-cycle extends over about 50 days. No parasites have been reared from this species in Southern Nigeria.

The eggs of *Argyroploce leucotreta* are usually laid singly on the carpels of the green or open bolls or on the buds and hatch in 4 or 5 days. The larvae immediately tunnel in the carpel wall, usually for some distance, before entering the interior of the bolls ; it appears that they often introduce internal boll disease, and they also attack ripe and damaged bolls to such an extent that they have hitherto been considered to be scavengers. Each larva remains in one boll provided that it contains enough food. The average length of the larval stage is 15 days. The silken cocoons are spun in dried leaves and rubbish on the ground, and the pupal stage lasts about 13 days, the total life-cycle occupying an average of 38 days. The male is described for the first time, and the original description of the female is quoted. A Braconid, *Chelonus* sp., has been bred from the larvae, but is rare. A Hymenopterous egg parasite has also been reared, the percentage of eggs parasitised being sometimes as high as 50. *A. leucotreta* has been bred from fruits of guava [*Psidium guayava*] after the cotton had been uprooted, and it is possible that this may prove to be an important alternate food-plant and that others may be found.

Prodenia litura is an occasional pest of cotton, and may do considerable damage, especially in the absence of other food-plants ; the larvae of the later instars feed inside the bolls. The life-history of this moth on maize is quoted from a paper previously noticed [*R.A.E.*, A, iii, 166]. The larvae are parasitised by a Braconid and a Nematode. *Heliothis obsoleta* is a minor pest of cotton in Southern Nigeria, but like the preceding species may cause serious damage locally. It is an omnivorous feeder, and its occurrence on cotton at Ibadan is probably due to the proximity of Leguminous cover crops, such as *Dolichos lablab* and *Canavalia* spp., on which it is often abundant. The larvae pupate in the soil, and the pupal period lasts from 13 to 18 days in the cotton season. A Tachinid has been bred from the larva.

Diacrisia (*Spilosoma*) *maculata*, Cram., *Nygmia fasciata*, Wlk., and *Mussidia nigrivenella*, Rag., have a large variety of food-plants and sometimes attack cotton bolls ; the last-named moth and *Pyroderces simplex*, Wlsm., *P. coriacella*, Snell., *Mometa zemiodes*, Durrant, and *Plemyristis oenochares*, Meyr., occur, mainly as scavengers, in open and dried bolls [*cf.* *R.A.E.*, A, iii, 164]. The larvae of *Parasa infuscata*, Wichg., *Sylepta derogata*, F., *Zebronia phenice*, Cram., *Cosmophila flava*, F., *Leipoxais siccifolia*, Auriv., *Nemoria stibolepida*, Butl., and *Tortrix* (*Cacoecia*) *occidentalis*, Wlsm., feed on the leaves of cotton and may occasionally be found on the bracts or flowers. *Earias ogovana*, Holl., has been taken at light, but not bred.

RAMACHANDRA RAO (Y.). **A New Pest of Pepper.**— *Madras Agric. Dept. Year Book 1924*, pp. 21-23. Madras, 1925. [Recd. May 1926.]

In connection with the "Pollu" disease of pepper [*R.A.E.*, A, ix, 214] it has been found that a Cecidomyiid is responsible for a certain proportion of the loss in the earlier stages. The larva is found embedded in the tender tissues of the pulp between the young pepper kernel and the attachment of the berry to the spike. As it grows it produces a gall chamber so that all nutrition to the kernel is cut off and its further growth is stopped. When full grown, the larva emerges through a hole in the skin of the berry and drops to the ground, and probably pupates in the soil. The eggs are presumably laid on the surface of the spike. Early in the season the attacked berries are conspicuous owing to their greater size, whereas later, when the healthy ones develop, they are recognised by their stunted shape. The larvae also cause swellings in tender leaf stalks and shoots. Two generations have been noticed between the end of July and beginning of September. The larvae are parasitised by a species of *Platygaster* and a Braconid.

ATKINSON (D. J.). **Some Types of Teak Defoliation.**—*Indian Forester*, lii, no. 4, pp. 141-145, 2 pls. Allahabad, 1st April 1926.

In western Madras the injury to teak by various leaf-eating insects is, in many cases, sufficiently distinctive for it to be possible to determine the species responsible by an examination of the damaged leaves alone, although the nature of the injury may vary considerably according to the age of the leaf and the instar of the larva attacking it. Descriptions are given of the injury to the leaves caused by the feeding of the larvae of *Hyblaea puera*, Cram. (teak leaf defoliator), *Pyrausta machaeralis*, Wlk. (teak leaf skeletoniser), and *Diacrisia obliqua*, Wlk., under the varying conditions of age of larva and leaf, with brief mention of that caused by *Aularches miliaris*, L., Curculionids, such as *Astycus aurovittatus*, Hell., and *Sympiezomias beesoni*, Mshl., Chrysomelids, and Geometrids. Although some 26 species of insects are recognised as regular teak feeders in western Madras, only *H. puera* and *P. machaeralis* commonly cause serious defoliation.

FULMEK (L.). **Zuigende insecten op Deli-tabak (Aphididae, Capsidae, Thysanoptera).** [Sucking Insects on Tobacco in Deli.]—*Bull. Deli Proefst.*, no. 22, 6 pp. Medan, 1925. [Recd. April 1926.]

Aphids and Capsids are only harmful to tobacco when very abundant. Their occurrence on field tobacco depends, apart from general favourable circumstances, on the surrounding vegetation, and if measures against an annual injury are to be avoided, clean cultivation must be maintained.

Injury by thrips has hitherto been usually overlooked or attributed to other causes. A list of those found on tobacco in Java and Sumatra has already been noticed [*R.A.E.*, A, xiii, 290].

TAKAHASHI (Ryoichi). **Some Aphididae of Sumatra (Hemiptera).**—*Bull. Deli Proefst.*, no. 24, 6 pp., 1 fig. Medan, 1925. [Recd. April 1926.]

No list of the Aphids of Sumatra appears to have been published hitherto. Those recorded here are: *Macrosiphum rosae*, L., on rose; *M. polypodicola*, Tak., on *Dryopteris arida*; *M. woodwardiae*, Tak.;

M. orientale, Goot, on *Blumea balsamifera*; *Myzus persicae*, Sulz., on tobacco, *Acalypha boehmeroides* and *Senecio sonchifolius*; *Pentalonia caladii*, Goot, on *Caladium bicolor* (possibly identical with *P. nigronervosa*, Coq.); *Aphis* (*Rhopalosiphum*) *pseudobrassicae*, Davis, on *Gynandropsis speciosa* and *Brassica rugosa*; *Aphis maidis*, Fitch, on maize (*Zea mays*) and *Rottboelia glandulosa*; *A. gossypii*, Glov. (*tectonae*, Goot), on egg-plant (*Solanum melongena*), *Colocasia antiquorum*, *Hibiscus rosa-sinensis*, teak (*Tectona grandis*), and many other plants; *A. medicaginis*, Koch, on *Vigna sinensis* and *Phaseolus lunatus*; *Anuraphis helichrysi*, Kalt., on *Ageratum conyzoides*; *Oregma rhaphidis*, Goot, on coconut; and *Tetraneura ulmi*, DeG., on *Colocasia antiquorum*.

FULMEK (L.). **Die kleine grüne Tabakswanze (Capside) auf Sumatra.** [The small green Tobacco Bug in Sumatra.]—*Bull. Deli Proefst.*, no. 25, 14 pp., 1 fig., 7 refs. Medan, 1925. [Recd. April 1926.]

The green Capsid attacking tobacco in Java is *Dicyphus* (*Gallobelicus*) *nicotianae*, Kon. The species found on tobacco in Sumatra is not identical with it, as has hitherto been believed, and it is described here as *D. nocivus*, sp. n.

The following information refers to the Sumatran species, but probably applies to a large extent to the one in Java as well. The punctures of the bug cause minute spots that gradually become holes of larger size and cracks about 1 inch in length. In field tobacco the injury becomes visible at the end of May or in June, and is particularly marked in the plants that were the last to be planted out. Injury is seldom noticed on seedlings, nor is it often seen on the small, narrow leaves. Most of the injury occurs in the upper part of the plants, where the Capsids tend to assemble. As the injury becomes apparent some time after it has been done, any measures that are taken at first reduce the pests, but not the damage. *D. nocivus* feeds on animal as well as on vegetable food, and on tough-leaved tobacco where the leaf injury is quite negligible it may be regarded as useful as it destroys Aphids. The larvae are usually found on the undersides of the leaves. The life of the adult lasts about 15 days, and it flies readily by day. A female lays about 30 eggs at a maximum on the mid-rib, nervures, flower-stalks and stems. The egg-stage lasts 6-10 days. The adult stage is reached after five moults in about 20-23 days, the complete cycle from egg to adult thus occupying 26-33 days. Spraying measures against this Capsid are rarely of practical value; but the winged individuals might be captured on sticky screens. No other food-plant of *D. nocivus* has yet been found.

KARNY (H. H.). **Ueber die Raupe von** *Suana concolor* **(Lep. Lasiocampidae).** [The Caterpillar of *S. concolor*.]—*Treubia*, vi, no. 3-4, pp. 221-224, 1 pl. Buitenzorg, 1925. [Recd. April 1926.]

In the Dutch East Indies *Suana concolor* occurs on tea, avocado, etc. It is a source of trouble owing to its urticating hairs, which are described in detail.

JOHN (O.). **Termiten von Ceylon, der Malayischen Halbinsel, Sumatra, Java und den Aru-Inseln.**—*Treubia*, vi, no. 3-4, pp. 360-419, 8 pls. Buitenzorg, 1925. [Recd. April 1926.]

The distribution, post-embryonal development and biology of many termites, including several new species, from Ceylon, the Malay Peninsula, Sumatra, Java and the Aru Islands are dealt with.

VITZTHUM (H.). **Malayische Acari.**—*Treubia*, viii, no. 1-2, pp. 1-198, 111 figs. Buitenzorg, January 1926.

This catalogue of Malayan mites comprises 58 species, of which 26 are new.

DEMANGE (V.). **Note sur une chenille dévastatrice du riz** (*Leucania unipuncta*, **Haw.**).—*Bull. écon. Indochine*, no. 175, pp. 587-592. Hanoi, 1925. [Recd. April 1926.]

Ricefields in Indo-China are periodically infested by the army worm, *Cirphis* (*Leucania*) *unipuncta*, Haw. A popular account is given of this moth, its development in Indo-China being practically identical with that in other countries. Heavy infestations occur in summer during the rains, and two have coincided with floods, which apparently favour abnormal numbers of the larvae. The chief remedial measures practised in the United States, namely trench-digging and arsenical spraying, are impracticable in ricefields.

ROHWER (S. A.). **Three Sawflies from Japan.**—*Jl. Wash. Acad. Sci.*, xv, no. 21, pp. 481-483, 2 refs. Baltimore, Md., 19th December 1925.

The sawflies, *Dolerus hordei*, sp. n., and *D. yokohamensis*, sp. n., from Japan are stated to be of some economic importance. The former was bred from larvae feeding on barley.

NAGAMORI (S.). **Silkworms with five Moults.** [*In Japanese.*]—*Dobutsugaku Zasshi* [*Zool. Mag.*], xxxviii, no. 447, pp. 3-4. Tokyo, January 1926.

The larva of *Bombyx mori*, L., usually moults 4 times, but sometimes 5. The extra moult seems to be due to shortage of food. Some races in Korea and China, as well as *B. mandarina*, Moore, only moult 3 times.

MURATA (J.) & IKEDA (T.). **Studies on a New Pest of** *Arctium lappa* (**Compositae**), *Cleonus superciliosus* **Schönh.** (**Curculionidae**). [*In Japanese.*]—*Insect World*, xxx, no. 3, pp. 83-88; no. 4, pp. 131-135. Gifu, March & April 1926.

The eggs of *Xanthochelus faunus*, Oliv. (*Cleonus superciliosus*, Gyll.) are laid in May and June on *Arctium lappa* (burdock) [the roots of which are cultivated in Japan as a vegetable]. They hatch in about 10 days, and the larvae bore into the root, pupating about 50 days later. The adults emerge in about 9 days and then hibernate.

KUWAYAMA (S.). **The Principal Insect Pests of the Soy Bean in Hokkaido.** [*In Japanese.*]—*Hokkaido Agric. Expt. Sta.*, Bull. 39, pp. 1-94, 2 pls. Sapporo, February 1926.

More than 30 insects are injurious to the soy bean [*Glycine hispida*] in Hokkaido, of which the following are the most important. The Galerucid, *Monolepta nigrobilineata*, Mots., seems to have one generation a year and hibernates in the adult stage. The adults appear in June and continue to attack the leaves up to the middle of August. The immature stages are unknown. Another Galerucid, *Luperodes discrepans*, Baly, feeds on the tender leaves of soy bean, sugar-beet, peppermint, clover and other Leguminosae, and dandelion, *Artemisia* and other Compositae, both in the adult and larval stages. The larvae appear in May and pupate in the ground in the middle of July, the adults emerging a week later. *Popillia japonica*, Newm., usually has a two years' life-cycle, though some individuals take only one year to reach the adult stage. Hibernation is passed in the mature larval stage, pupation occurring in June; the adults, which feed on a great variety of plants, emerge in June and July. The Tachinid parasite, *Centeter cinerea*, Aldr., has one generation a year, the adult emerging in advance of its host [*cf. R.A.E.*, A, xii, 172].

Podisma pedestris sapporense, Shiraki, has one generation a year, the eggs hatching in May or June. This Acridid destroys various cultivated crops as well as many wild plants. *Illinoia* (*Macrosiphum*) *pisi*, Kalt., is found on soy bean from the beginning of July to October, being most abundant from August to the beginning of September. A Cecidomyiid, *Johnsonomyia* sp., is also very injurious to this crop. There is one generation a year, the adults appearing from the end of July to the end of August. The larvae bore into the stalks of the leaves and are most numerous towards the end of August.

Heliothis (*Chloridea*) *dipsacea*, L., has 2 generations a year and hibernates in the pupal stage in the ground. The adults emerge in June and again in the early part of August. They are diurnal in habit, and lay eggs singly on the leaves of soy bean and other leguminous plants, sugar-beet, etc. The egg stage lasts a week, the larval a month and the pupal 2 weeks in summer. The larvae of the first generation attack the leaves of soy bean, but those of the second also attack the fruit. *Paniscus unicolor*, Smith, is an effective parasite of this Noctuid. It has 2 or more generations a year, the adults emerging in June, August and September, and oviposting on the mature larvae of the host. The larvae rest on the surface, and never actually enter the body of the host; after 2 or 3 weeks they pupate in the ground. Another Noctuid, *Pyrrhia umbra*, Hufn., takes a year to complete its life-cycle and hibernates in the pupal stage. The moths emerge in the middle of June and lay eggs singly on the leaves. The larvae, which hatch in about a week, attack the leaves in the younger stage and the fruits later; they pupate in September. They attack tobacco as well as other leguminous plants. *Colias hyale poliographus*, Mot., has 3 and sometimes 4 generations a year, and hibernates in the adult stage. The eggs hatch in 3-7 days. The larvae are not gregarious and only feed on the leaves of various leguminous plants; they pupate in 2 or 3 weeks, this stage lasting 10-14 days. *Cydia* (*Laspeyresia*) *glycinivorella*, Mats., is widely distributed over Japan, causing serious damage to soy beans every year in Hokkaido. There is one generation a year, and hibernation occurs in the prepupal condition in a cocoon in the ground, pupation taking place at the end of July and the adults emerging in August. The eggs are usually laid singly, sometimes 2 or 3 together, on the pods. The larvae bore into the fruits, and mature in a month, during which period 4 moults occur ; they then enter the ground for hibernation. The moths fly short distances in the morning and evening. At present no other food-plants are known.

Remedial measures for all these pests every month in the year are given in detail, with an account of a Nematode, *Heterodera schachtii*, Schmidt, also injurious to soy beans in Hokkaido.

TINDALE (N. B.). **Notes on the Life-history of the Moth,** *Cacoecia postvittana*, **Walk. (Tortricidae).**—*S. Aust. Nat.*, vi, no. 1, pp. 7-9, 4 figs. Adelaide, November 1924.

Tortrix (*Cacoecia*) *postvittana*, Wlk., attacks apple, pear, orange, rose and various other cultivated flowers and fruits in South Australia. Sometimes the caterpillar burrows into the heart of a fruit, and sometimes it feeds inside a few leaves bound together. In the case of the orange, the larva feeds by night on the white pithy portions and the skin, making open excavations, which it covers over with a web, and in which it remains concealed by day. The fruit attacked becomes soft and mouldy. The moths are common in open places and in the vicinity of orchards in September, December, January and March.

BURNS (A. N.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxv, pt. 3, pp. 202-205. Brisbane, 1st March 1926.

Notes are given on the times of appearance and the habits of the adults of the following Coleoptera injurious to sugar-cane : *Lepidoderma albohirtum*, Waterh. (grey-back cane beetle), *Lepidiota frenchi*, Blackb., *L. rothei*, Blackb., *Anomala antiqua*, Gyll. (*australasiae*, Blackb.), *Anoplognathus boisduvali*, Boisd. (Christmas beetle), and *Isodon puncticolle*, MacL. The last apparently causes very little damage to sugar-cane and occurs in isolated patches where there is manure or humus in the soil. The larvae of *Dasygnathus australis*, Boisd., which feed on cane roots, also occur in isolated colonies.

A newly-transformed adult Histerid, *Platysoma* sp., was found in a puparium of the Tachinid, *Ceromasia sphenophori*, Vill., in cane infested with the weevil borer [*Rhabdocnemis obscura*, Boisd.]; subsequently other individuals of the same species of *Platysoma* were found in association with puparia of *C. sphenophori*, and no living pupae of the latter were found where these were present.

Serious damage to maize and sugar-cane in several places in North Queensland has been caused by army worms, probably *Laphygma* (*Prodenia*) *exempta*, Wlk. In one case huge numbers of larvae completely destroyed a 20 acre field of young maize and then migrated into the adjoining cane fields. Several species of Tachinids were observed ovipositing in the larvae in fairly large numbers, but the larvae so parasitised almost invariably reach the pupal stage. In order to confine the larvae to a field already infested and prevent the spread of infestation, a trench or plough furrow (with the steep side away from the infested field) should be made round it ; a poisoned bait consisting of Paris green 1 lb., bran 2 lb., molasses 2 quarts, and enough water to make a mixture that will break up easily, should be sprinkled thinly in the bottom of the trench. To check the advance of the arvae into an uninfested part of a field the cane for two or three rows n front of them should be sprayed with 2lb. lead arsenate paste to 50 gals. water.

MUNGOMERY (R. W.). **[Field Reports of the Southern Assistant Entomologist.]**—*Queensland Agric. Jl.*, xxv, pt. 3, pp. 206, 210-212. Brisbane, 1st March 1926.

In the Isis district of Southern Queensland the most important pest of sugar-cane is the Dynastid, *Pseudoholophylla furfuracea*, Burm., which causes serious losses; frequently as many as 30 larvae may be found feeding on the roots of a single stool of cane. Large numbers of adults and larvae have been collected, and over £500 has been expended by a local organisation paying 1*s.* per quart for larvae and 1*s.* 6*d.* per quart for adults. If the larvae are collected when the land is ploughed, at any time but the winter, when they burrow deep into the soil, the land will be reasonably free from infestation and a good crop of cane will be assured. For the destruction of the larvae injuring ratoon crops the soil should be fumigated with paradichlorobenzene. Parasites of *P. furfuracea* are apparently scarce, but the larvae are attacked to a certain extent by Scoliids, the latter being, in turn, parasitised by a Bombyliid, *Hyperalonia* sp. Several specimens of a Tachinid were bred from an adult beetle, and Asilid larvae have been found preying on the larvae. *Phragmatiphila truncata*, Wlk. (moth borer) and *Pseudococcus* sp. occur on cane in the district, but are not of much importance; the latter is attacked by fungus. In the adjacent district of Bundaberg *P. furfuracea* was of minor importance, but some damage was caused by *Lepidiota grata*, Blackb.

GIRAULT (A. A.). **Some Notes on Western Queensland Fruit Insects.**—*Queensland Agric. Jl.*, xxv, pt. 3, pp. 235-236. Brisbane, 1st March 1926.

Vineyards visited in Western Queensland were exceptionally free from pests, and *Citrus* was, on the whole, little damaged by insects, but *Chrysomphalus* (*Aspidiotus*) *aurantii*, Mask. (red scale) was generally distributed. *Biprorulus bibax*, Bredd. (spiny orange bug) was a common but not very important pest; the adults feed on ripe pomelos [*Citrus decumana*] or green oranges, or on the flowers; the eggs, from which several parasites were obtained, are laid in clusters of about 12 on the upper surface of the leaves; the larvae are described. The orange butterflies, *Papilio aegeus*, Don., and *P. anactus*, MacL., both occur in the district; the injury caused by the larvae is usually confined to the new growth of young trees and is sometimes sufficient to necessitate spraying with arsenicals. The eggs of *P. anactus* are deposited on the tips of young leaves, and the larvae are solitary. *Valanga* (*Acridium*) *irregularis*, Wlk., was common on *Citrus* foliage, and is thought to cause scarring of the fruit. Other insects observed on *Citrus* were *Uracanthus cryptophagus*, Olliff, a larva of which was found to have made a more or less spiral burrow about 3 feet long in a branch about 1 inch thick, a bug, probably *Amorbus robustus*, Mayr, the orange siphanta [*Siphanta acuta*, Wlk.], *Saissetia* (*Lecanium*) *hemisphaerica*, Targ., and *Macrosiphum* (*Siphonophora*) *citrifolii*, Ashm.

The Tingid, *Froggattia olivina*, Horv., was found on the underside of olive leaves, which it discolours to some extent ; the larva is briefly described.

Bunchy Top.—What it is, how to detect it, what to do.—*Queensland Agric. Jl.*, xxv, pt. 3, pp. 259-268, 9 figs. Brisbane, 1st March 1926.

This brief popular article describing the nature and symptoms of "bunchy top" disease of bananas, transmitted by the banana aphis [*Pentalonia nigronervosa*, Coq.], and the measures to be employed for its eradication, is based on a report previously noticed [*R.A.E.*, A, xiv, 95]. A proclamation prohibiting the removal of any banana plant or sucker from any place in Queensland, unless such place has been inspected within fourteen days previously and the plant or sucker certified to be free from disease, is appended.

ARTHUR (J. M.) & HARRISON (T. H.). **Calcium Cyanide Dust for Fumigation of Citrus. Experiments to determine Dosages.**—*Agric. Gaz. N.S.W.*, xxxvii, pt. 3, pp. 245-248, 2 refs. Sydney, 1st March 1926.

As the results of a series of experiments in fumigating orange trees under tents with calcium cyanide dust (containing approximately 50 per cent. calcium cyanide) for the control of *Chrysomphalus aurantii*, Mask. (red scale), and *Ceroplastes ceriferus*, And. (white wax scale), it is concluded that it is perfectly safe to use Allen's table for sodium cyanide and sulphuric acid [*Agric. Gaz. N.S.W.*, xiv, 1903, pp. 604-606]* reading ounces of calcium cyanide dust for ounces of sodium cyanide. The dosages employed varied from 37½ per cent. to 500 per cent. of those there given ; the dust was applied with a rotary blower that distributed it more or less evenly throughout the tents ; the fumigation was carried out between 6 and 8.30 p.m., the temperature ranging at the time from 67 to 75° F. (dry bulb) and from 62 to 68° F. (wet bulb), and the humidity from 59 to 74 per cent. The results were in all cases satisfactory, and even the highest concentrations caused no permanent damage to the trees. The authors consider, however, that further work will probably show the economically efficient dosage to be from 50 to 75 per cent. of that recommended in the table.

In view of the fact that satisfactory results were obtained by using approximately one-sixth of the quantity of calcium cyanide dust used by Quayle [*R.A.E.*, A, xii, 35] on the basis of experience in California, the authors suggest that there are other factors than atmospheric humidity that govern the evolution of hydrocyanic acid gas from calcium cyanide dust.

As the expense of the blower that has been considered necessary for applying calcium cyanide dust under tents is considerable, the dust was applied to several trees by throwing it through the foliage from a scoop ; the results from this method appeared to be entirely satisfactory.

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* It is on this table that the American Cyanamid Company's table for the humid costal regions of New South Wales [*R.A.E.*, A, xiv, 247] is based, ounces of sodium cyanide in the former being read as ounces of calcium cyanide in the latter.

YOUNG (J. H.). **Apple Spraying with Arsenate.**—*Fruit World of Australasia*, xxvii, no. 3, p. 130. Melbourne, March 1926.

The average orchard spray consists of 1 lb. lead arsenate to 20 gals. water, or 350 grains of lead arsenate to 70,000 grains of water—that is, 1 gallon. The area covered by 1 gallon depends on the distance of the sprayer from the object and the type of nozzle used, but assuming that the result of an average spraying is 1 gal. to 5,000 sq. ft., the amount of lead arsenate will equal 1/2,000 of a grain per sq. in. Taking the average apple as offering 5 sq. in. to the spray, this is equal to 1/400 of a grain on each apple. But as lead arsenate only contains 1/3 of arsenic oxide, each apple will hold about 11/200 of a grain of arsenic oxide. Four apples to the pound will give 1/300 of a grain of arsenic oxide to the pound, while the regulation prescribes not more than 1/100 of a grain to the pound. The spray partly missing the fruit, weather conditions, leaf rubbing and necessary handling will reduce this poison liability still further. The British Ministry of Health has recommended that scientific methods of insect control should replace chemical poisons. It is suggested that this might be largely effected by means of lures and traps throughout the season, systematic gathering up of fallen fruit, and two lead arsenate sprays before the end of December.

NICHOLLS (H. M.). **Annual Report of the Government Microbiologist.**—*Tasmania Agric. & Stock Dept. Rept., 1924-25*, p. 4. Hobart, 1925. [Recd. 3rd May 1926.]

Experiments to test the effects of cold storage on larvae of the Mediterranean fruit-fly [*Ceratitis capitata*] showed that a week in a local cold store where apples are kept, and where the temperature was between 37° and 37·5° F. all the time, was not sufficient to kill all larvae present. Larvae of *Dacus ferrugineus* (*tryoni*) (Queensland fruit-fly) were also found to have survived. *Aphelinus mali* has been introduced from Western Australia on apple twigs infested with woolly aphis [*Eriosoma lanigerum*], and is apparently already multiplying rapidly and largely reducing the numbers of the Aphid. In connection with raspberry diseases, the root disease, *Rossellinia* sp., has been generally supposed to be caused by a larva that attacked the roots; these larvae when bred out proved to be those of the Stratiomyiid fly, *Metaponia prisca*, and they apparently feed on the decaying matter produced on the roots by the fungus and not on the roots themselves.

JARVIS (E.). **Notes on Queensland Cane Insects and their Control.**—*Queensland Bur. Sugar Expt. Sta.*, Div. Ent., Bull. 19, 72 pp., 11 pls., numerous figs. Brisbane, 1926.

This is a compilation of data obtained during the period October 1923 to December 1924, in continuation of a previous bulletin [*R.A.E.*, A, xiii, 405], the bulk of the information having been already noticed from monthly reports.

FRYER (J. C. F.). **Some Aspects of Plant Pest Legislation.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 170-177. Melbourne [1926].

It is pointed out that the evolution of plant pest legislation is tending in two directions, namely, general prohibition and the certificate and inspection system. Though undoubtedly the former is the surest means of preventing the spread and establishment of noxious pests, it has the disadvantage of interfering with trade. Suggestions are made regarding the policy to be followed in framing legislation of this kind.

FROGGATT (J. L.). **Some Features in the Habits and Life History of the Banana Weevil** (*Cosmopolites sordidus* **Chev.**) **as bearing on Control Measures.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 342-352. Melbourne [1926].

The bulk of this information on *Cosmopolites sordidus*, Germ., in Australia has already been noticed from other sources [*R.A.E.*, A, xiv, 128, etc.]

TRYON (H.). **The Genus** *Platyedra* (**Cotton Pink Boll Worm Genus**) **in Australia.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 353-361. Melbourne [1926].

The occurrence of *Platyedra gossypiella*, Saund. (pink boll worm), and of possible races of it in Australia is reviewed [*cf. R.A.E.*, A, xiii, 518].

JARVIS (E.). **On the Life History and Control of** *Lepidoderma albohirtum*, **Sugar Cane Pest of North Queensland.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 362-376, 6 refs. Melbourne [1926].

This is an account of the work against *Lepidoderma albohirtum*, Waterh., begun by the author in 1914. Most of the information has already been noticed from time to time in this *Review* [*R.A.E.*, A, xii, 234, etc.].

VEITCH (R.). **Notes on Some Attempts to Control Fijian Plantation Pests by the Introduction of Parasites and Predators.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 377-383. Melbourne [1926].

In 1910 an attempt was made to establish the Tachinid, *Ceromasia sphenophori*, Vill., in Fiji to control *Rhabdocnemis obscura*, Boisd., this being the first effort in biological control in the Island. Since then various parasites and predators of different pests have been introduced, the history of the work being reviewed. On the whole the results have been satisfactory, though in some instances they have been disappointing. The establishment of the above mentioned Tachinid, however, would alone justify the expenditure incurred.

TILLYARD (R. J.). **History of the Introduction of Beneficial Insects into New Zealand.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 383-390, 5 refs. Melbourne [1926].

An account is given of the accidental and intentional introduction of various beneficial insects into New Zealand, including Coccinellids and parasitic Hymenoptera.

SWEZEY (O. H.). **Benefits derived in the Hawaiian Islands from the Control of Sugar Cane Insects by the Introduction of their Natural Enemies.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 390-399. Melbourne [1926].

In spite of the many failures experienced in the course of introducing beneficial insects into Hawaii, these islands have proved more favourable for such work than many other countries owing to the limited insect fauna; consequently, provided that care is taken to exclude the introduction of hyperparasites, the new parasite is unlikely to have to compete with any such enemies. Some of the work hitherto done is reviewed.

SCHULTZE (W.). **Timber-boring Insects, with Special Reference to the Exportation of Philippine Lumber.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 399-402. Melbourne [1926].

In view of the assertion that living insects, particularly *Xyleborus* spp. (pin-hole borers), might be introduced into Australia in timber imported from the Philippines, certain investigations were undertaken, from the results of which it is safe to conclude that no borers are present in Philippine heartwood timber that has been seasoned for 2 months or more and sawn into boards or pieces of various sizes. It is probable that certain borers might be transferred with timber exported in the natural bulk, such as trunks of trees, even if they had been seasoned for a relatively long period, but apparently Philippine timber has not so far been imported into Australia in this form.

Several Scolytids and two Bostrychids have been found boring in trees in Negros. The most injurious are three species of *Xyleborus*, which finally penetrate into the heartwood. The species living between the bark and the sapwood or in the sapwood are *Eurydactylus sexspinosus*, Mot., *Ozopemon laevis*, Strohm., and two other species of this genus, probably new. The Bostrychids, one of which is *Heterobostrychus aequalis*, Web., feed in the sapwood of fresh and seasoned timber.

The chief method of reducing attack by pin-hole borers is to shorten the period between felling and arrival at the sawmill. This interval should not exceed 2-3 weeks.

EHRHORN (E. M.). **Plant Quarantine Protection as employed in Hawaii.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 403-406. Melbourne [1926].

An account is given of the organisation and equipment of the plant quarantine service in Hawaii, showing the efficiency of the existing inspection.

HILL (G. F.). **Insects affecting Cotton in Australia.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923,* i, pp. 406-408. Melbourne [1926].

The following insects have come under the author's personal observation as pests of cotton in the Northern Territory of Australia: Lepidoptera, *Earias fabia,* Cram., *E. huegeli,* Rog., *Platyedra gossypiella,* Saund., and *Pyroderces pyrhodes,* Meyr.; and Rhynchota, *Oxycarenus arctatus,* Wlk., *Tectocoris lineola,* F., and *Dysdercus cingulatus,* F. *Earias smaragdina,* Butl., also occurs in the Northern Territory, but its food-plants are not known. *T. lineola* appears to be comparatively scarce, but the other pests are all important, *E. fabia, E. huegeli* and *Platyedra gossypiella* being the most destructive. Their distribution in other parts of Australia is discussed.

The Chalcid, *Bephratella sarcophaga,* Gir., and an unidentified Ichneumonid are important natural enemies of *E. huegeli* in the Northern Territory. The eggs of *T. lineola* are parastised by the Proctotrupid, *Telenomus darwiniensis,* Dodd.

WEARNE (W. L.). **Notes on Timber Borers (Abstract).**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923,* i, pp. 412-413. Melbourne [1926].

Attention is drawn to the annual loss caused by the action of timber-boring beetles in freshly fallen logs and seasoned sawn timber in New South Wales. Infestation by the pin- and shot-hole borers (*Xyleborus* and *Platypus*) occurs between the cutting of the logs in the forest and their removal to the mill or port. *Lyctus* can only be eliminated by the removal of the sapwood at the sawmills. *Anobium punctatum* (furniture beetle) is the most serious borer of seasoned timber. The chief source of infestation is from imported New Zealand white pine (*Podocarpus dacrydioides*), which is apparently refused for constructional purposes by New Zealand builders owing to its susceptibility to attack. It is considered that the Government should appoint an expert to investigate the matter and suggest future action in order to prevent the spread of these timber pests.

TRAPP (V. B.). **The Borer in Timber.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923,* i, pp. 426-434. Melbourne [1926].

The danger of introducing serious pests and the importance of protecting the Australian forests against such introductions is pointed out. *Lyctus brunneus,* though a serious pest, does not attack the heart of Australian hardwoods. There is, however, serious danger of importing a new pest from the islands north of Australia. This borer is alive when the logs are sawn, and was found to be still present in logs when they arrived at Sydney, though there was no visible sign on the outside, and it was supposed that the treatment had killed the borers. The expenditure of different countries on the protection of forests is discussed and compared with that of Australia, where the appropriation is considered wholly inadequate.

CÉARD (L.). **Note sur les ravages de la Cochenille du Dattier dans la Palmeraie de Colomb-Bechar (Sud-Oranais).**—*Arch. Inst. Pasteur Algérie*, iii, no. 1, pp. 64-67, 1 ref. Algiers, March 1925. [Recd. April 1926.]

Parlatoria blanchardi is an important pest of date palms at Colomb-Bechar (Algeria) [*R.A.E.*, A, xiii, 168, 169]. Details are given of the method of controlling it by removing the infested leaves and then burning the tree over with torches.

DOYER (L. C.). **Seed Injury from Fungi and Insects.**—*Internat. Rev. Sci. & Pract. Agric.*, N.S. iv, no. 1, pp. 150-154. Rome, January-March 1926.

These data were collected at Wageningen, Holland. Beans in the field may be seriously attacked by *Bruchus obtectus*, which also occasionally infests them in store. *B. atomarius* and *B. rufimanus* are also found in the seeds of field beans. Peas may be damaged by *B. pisorum* (*pisi*) or by the Tortricid, *Cydia* (*Grapholitha*) *nebritana*. Amongst tree seeds *Pseudotsuga taxifolia* (*douglasi*) is attacked by the Chalcid, *Megastigmus spermotrophus*; *Abies pectinata* by *M. strobilobius*; *Rosa multiflora* by *Megastigmus* sp.; and *Betula alba* by the Cecidomyiid, *Oligotrophus betulae*.

WOLCOTT (G. N.). **Insect Pests in Haiti.**—*Internat. Rev. Sci. & Pract. Agric.*, N.S. iv, no. 1, pp. 187-189. Rome, January-March 1926.

Cotton pests of importance in Haiti are *Alabama argillacea*, Hb., *Dysdercus andreae*, L., *Tetranychus bimaculatus*, Harvey, and *Pinnaspis* (*Hemichionaspis*) *minor*, Mask. The pink bollworm, *Platyedra* (*Pectinophora*) *gossypiella*, Saund., is a serious pest on Sea Island cotton, but does little damage to native cotton, which is more extensively grown. Coffee has no serious pests. Sugar-cane is attacked by a termite, *Nasutitermes pallidiceps*, Bks., a leaf-eating caterpillar, *Calisto pulchella*, Lathy, *Diatraea saccharalis*, F., the white grub, *Lachnosterna hogardi*, Blanch., and the army worm, *Laphygma frugiperda*, S. & A. Sweet potatoes are attacked by *Cylas formicarius*, F., and bananas by *Cosmopolites sordidus*, Germ. Young coconut trees are often injured by rhinoceros beetles, *Strataegus quadrifoveatus*, P.B., and the Coccid, *Aspidiotus destructor*, Sign. *Citrus* trees are infested with most of the common scale-insects as well as by the black-fly, *Aleurocanthus woglumi*, Ashby.

VIGGIANI (G.). **Alcune notizie sulla morfologia e sulla biologia della** *Tropinota hirta* **con speciale riguardo ai danni da essa recatí alle coltivazioni erbacee ed arboree.** [Some Notes on the Morphology and Biology of *Epicometis hirta* with Special Reference to the Injuries to cultivated Grasses and Trees.]—*Boll. Soc. Naturalisti Napoli*, xxxvii (Ser. 2, xvii), pp. 28-53, 2 pls. Naples, 1925. (Abstract in *Internat. Rev. Sci. & Pract. Agric.*, N. S. iv, no. 1, pp. 209-210. Rome, January-March 1926.)

The Cetoniid, *Epicometis* (*Tropinota*) *hirta*, Poda, has increased in Campania of late years, causing serious injury to grasses and trees. When the beetle first appears, it prefers low ground, but subsequently migrates to the hills. Collection of the adults, particularly on their first appearance, seems to be the best measure. Hedges of hawthorn, clumps of elders, etc., planted around the fruit trees, and sowings of rape, cabbage and mustard between the rows will attract the beetles.

HILGENDORFF (G.) & BORCHERT (A.). **Ueber die Empfindlichkeit der Bienen gegen Arsenstäubemittel.** [On the Susceptibility of Bees to Arsenical Dust Insecticides.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 5, pp. 37-38, 3 refs. Berlin, May 1926.

The dusting of forests in Germany with arsenicals has raised protests from bee-keepers, and an investigation by the Imperial Biological Institute has proved conclusively that serious losses amongst bees is closely connected with such dusting.

WALTER (G.). **Die Bekämpfung der Forleule und der Nonne in den Oberförstereien Biesenthal und Sorau im Jahre 1925.** [Work against the Pine Moth and the Nun Moth in the Forestry Districts of Biesenthal and Sorau in the Year 1925.]—86 pp., 12 figs., 3 pls., 2 maps. Neudamm, J. Neumann, 1926. Price *Mks.* 7.

This is a detailed account of experiments made in 1925 against the pine moth [*Panolis flammea*] and the nun moth [*Lymantria monacha*]. Dusting with calcium arsenate from aeroplanes and fumigation with clouds of nicotine smoke were the methods employed.

It was found that preparations of calcium arsenate for dusting must contain at least 20 per cent. of pure arsenic; that at least 4½–5 lb. of pure arsenic is required per acre; and that aeroplane work in the evening is better than in the morning, and should only be attempted when the air is still. As regards fumigation, nicotine is the only substance of practical value; the material used as a carrier for the nicotine should be as free as possible from chemical substances other than the nicotine; each combustion-pot should be capable of generating a nicotine smoke cloud for 10 minutes; and fumigation must last 30 minutes in order to be successful and must be carried out when the wind is of the very slightest. These facts indicate that fumigation is always uncertain.

In a supplement the effect of calcium arsenate on the larvae of these moths is shown in a number of tables, and it is concluded that dusting with a suitable arsenical from an aeroplane is a practical method.

PHILIPPI (E.). **Die Steinobstgespinstblattwespe** (*Pamphilius* (*Lyda*) *nemoralis* **L.**). [The Stone-fruit Sawfly, *Neurotoma nemoralis*.]—*Nachr. Schädlingsbekämpfung*, i, no. 1, pp. 23-29, 5 figs. Leverkusen b. Köln, March 1926.

The larvae of *Neurotoma* (*Lyda*) *nemoralis*, L., attack the foliage of peach trees in the Durkheim district (Germany) in May. Peaches are easily defoliated by most sprays containing copper sulphate and arsenic, but it was found that this sawfly can be killed without injury to trees by a solution of 1 per cent. Bordeaux mixture and 1 per mille Urania green. Good results were also obtained with some proprietary compounds.

[MIGULIN (A.).] **Мигулін (О.). Pests of Sugar-beet.** [*In Ukrainian.*] 26 pp., 9 figs. Kharkov, Radyans'kiĭ Selyanin, 1926.

An account is given of the more important beet pests occurring in the Ukraine and their control. The insects are dealt with under their popular names, and include *Bothynoderes punctiventris*, Germ., *Euxoa segetum*, Schiff., *Loxostege sticticalis*, L., and Halticid and Melolonthid beetles.

[AVERIN (V. G.).] **Аверин (В. Г.). On the Control of Pests in 1926.** [*In Ukrainian.*]—79 pp., 27 figs. Kharkov, Ukrains'kiĭ Ekonomist, 1926.

An account is given of the probable abundance and distribution of insect pests in the Ukraine in 1926, and of methods of organising measures against them.

[POLOZHENTZEV (P. A.).] **Положенцев (П. А.). Forest Pests in the Buzuluk Conifer Forests of the Samara Government.** [*In Russian.*]—Lesovod [*Forester*], 1926, no. 2, reprint, 5 pp. [Moscow, 1926.]

During a survey of these forests, observations were made on the Longicorn beetles, *Monochamus galloprovincialis*, Oliv., and *Spondylis buprestoides*, L. The eggs of the former are laid in the bast, almost or directly in the cambium layer, of recently felled or standing trees; they may also be laid in any exposed roots of a diameter up to 1¾ in. The larvae hatch in 7-15 days and feed on the juicy bast layer; under favourable conditions they extend their tunnels into the sapwood after about 2 weeks, where they make irregular burrows and occasionally reach the heartwood. Larvae hatching from eggs laid in July were preparing to pupate in November.

Freshly cut trees attract the adults within 15-20 minutes, and they are more readily attracted to trap trees in shady places. Apparently healthy trees are attacked, and if infested in the spring, they wither by the autumn. Freshly felled pines are preferred to standing ones, the centre of the trunk being most attractive. The adults are on the wing from June to September or early October. As many as 2,000 egg pits have been found on a square metre of a trunk. The damage done by *M. galloprovincialis* is not limited to oviposition in healthy trees, as the adults ringbark the branches of the crown, which are then blown down by the wind. Remedial measures consist of collecting the adults on trap trees and removing the bark from these as soon as the eggs are laid and before the larvae have entered the sapwood.

The eggs of *S. buprestoides* are laid in the roots of dying pines, apparently very rarely in those of healthy ones. The larvae penetrate along the roots as deep as 9 feet in the soil, both thick and thin roots being attacked. The deeper the roots the younger are the larvae they contain, owing to the time it takes the adult to burrow through the ground for oviposition. The main flight of these beetles occurs in June and July, only a few individuals being seen in August. About 6,000 larvae were found per square metre of root, and they probably spend more than a year in this stage.

Other pests of less importance are *Ips acuminatus*, Eichh., which has at least 2 if not 3 generations a year, and is widely distributed; and

I. sexdentatus, Boern., which has 2 generations and is usually killed in the attacked pines by the resin flooding its mines.

Other species recorded, which are, however, of little economic importance, are : *Xyloterus lineatus*, Oliv., attacking dying pines and causing infestation by the fungus, *Ceratostomella pilifera* ; *Myelophilus minor*, L., *M. piniperda*, Hart., *I. proximus*, Eichh., *I. laricis*, F., *Hylastes ater*, Payk., *Hylobius abietis*, L., *Pissodes notatus*, F., and *Rhyacionia* (*Evetria*) *buoliana*, Schiff.

The Coccid, *Leucaspis pini*, Hartig (*candida*, Targ.) causes yellowing of the needles.

A more detailed account of this survey and a special paper dealing with Melolonthids will be published by other authors.

[Veber (Ya. Kh.).] **Вэбэр (Я. Х.). Report for 1925 and a Review of Control Measures against Pests during 1920–1924.** [*In Russian.*] —Samarsk. Stantz. zashchit. rast. vredit. [*Samara Plant Prot. Sta.*], no. 6, 110 pp. Samara, 1926.

This report includes a general account of the work of the station during the past five years and its reorganisation during 1925, with a list of the pests of stored products by the author. Other papers included are a general account of orchard, vegetable and field pests, and their seasonal occurrence by P. G. Chesnokov ; and a list of the Orthoptera of south-eastern (European) Russia by N. S. Shcherbinovskiĭ.

[Burakova (L. V.).] **Буракова (Л. В.). On the Biology of Mole-crickets.** [*In Russian.*]—*Rev. russe Ent.*, xix, no. 2, pp. 139–142. Leningrad, 1925. (With a Summary in German.) [Recd. June 1926.]

This is a short account of the life-history and habits of mole-crickets [*Gryllotalpa*] as a result of observations in the Government of Novgorod, which represents the northern limit of the distribution of these insects. Their preferred habitat is along the banks of rivers and ditches. The nests are found in the upper layers of the soil. The eggs are laid in June and hatch in July, the entire life-cycle from egg to adult lasting about 2–2½ years. Examination of the contents of the gut and laboratory feeding experiments show that the insects live on both animal and vegetable substances, including various insect larvae, earthworms, etc., and potatoes, carrots and beets.

The larvae of the mite, *Neothrombium neglectum*, Bruyant, attack both the young and adult mole-crickets and the Nematode, *Oxyuris korsakovi*, Sergiev, has recently been described from this host.

Chrystal (R. N.). **The Silver Fir Chermes.**—*Forestry Commission*, Bull. 7, 27 pp., 8 pls., 1 map, 4 refs. London, H.M. Stationery Office, 1926. Price 1*s.* 6*d.*

The chief species of silver fir used for forest planting in Britain are *Abies pectinata*, *A. grandis*, and *A. nobilis* ; *A. pectinata* is often seriously damaged by *Chermes* (*Dreyfusia*) *nüsslini*, Börn., and to a less extent by *C.* (*D.*) *piceae*, Ratz., but *A. grandis* and *A. nobilis* are rarely attacked, although they are not immune. The life-histories of

C. nüsslini and *C. piceae* in Britain and the nature of the injury that they cause to the trees are briefly described [*R. A.E.*, A, xiii, 533–536].

In order to obtain further information on the cultivation of silver fir and its relation to *Chermes* attack, the author paid a visit to Denmark. The silver fir, *Abies pectinata*, was introduced into Denmark in 1764 and has been grown very successfully in several places, particularly on the island of Bornholm ; the most suitable soil is a permeable sandy clay, while wet, thin and sandy, and highly acid soils are considered quite unsuitable, and it is when grown on such soils that the trees are most severely attacked by *Chermes*. Other important factors affecting the vigour of the trees, and so, indirectly, the extent of injury by *Chermes*, are climate and the selection of suitable seed ; trees grown from seed obtained from Thuringia have thriven much better in Denmark than those grown from seed from Tyrol and the south of France. In the districts most favourable to silver fir *Chermes* does occur, but in negligible quantities, and trees of all ages and species grow well. Elsewhere young stands are damaged by *C. nüsslini*, and in one district older trees have suffered from attacks by *C. piceae* on the trunk ; the attack may extend to a height of 30 feet, and when very severe and unchecked results in the death of the trees.

The bionomics of *C. nüsslini* and *C. piceae* in Denmark have been studied by Boas [*R.A.E.*, A, vii, 420], and are essentially the same as in Britain. The fact that *C. nüsslini* and *C. piceae* occur in Denmark on self-sown trees of all ages proves conclusively that the insects may spread naturally ; if Boas' theory that *C. nüsslini* and *C. piceae* are races of the same species is correct, it may be assumed that winged forms migrating from fir to fir may occur occasionally ; otherwise the spread must be due to wind, birds, or animals ; the author considers that wind carriage, which is known to occur in the case of *C. cooleyi*, Gill. [*R.A.E.*, A, x, 605], probably plays a large part in the distribution of *C. nüsslini* and *C. piceae* in Denmark.

In one part of Denmark spraying of silver firs for the control of *Chermes* has been practised extensively for 20 years, the spray used being a solution of lysol, 3–5 per cent. The trees are regularly inspected and are sprayed as soon as damage is noticed. The cost of inspection and spraying plantations ranges from 1*s*. 6*d*. to 6*s*. an acre yearly, and is considered to be amply justified by the results. Another measure for the control of *Chermes* that is regularly practised in Denmark, either alone or in conjunction with spraying, is thinning of the trees ; in several places very marked reduction in *Chermes* infestation has been effected by this means alone. The thinnings are made at intervals of 2–3 years ; a temporary increase of *Chermes* sometimes occurs after the first thinning, but infestation decreases with subsequent ones. The decrease of *Chermes* infestation is apparently due to the beneficial effect of light on the trees and to its unfavourable effect on the Aphids ; with regard to the latter it is suggested that light favours the production of winged sexuparae, which, in the absence of oriental spruce (*Picea orientalis*), fail to produce offspring.

The author considers that *Abies pectinata* can only be grown successfully in Britain, in the majority of cases, provided that sufficient precautions against damage by *Chermes* are taken both in the nurseries and in the young plantations. It is of great importance that clean stock only should be planted, and this can only be insured by raising trees from seed in places where there is no risk of infection. Spraying young plantations for the control of *C. nüsslini* is an effective and necessary operation, especially if accompanied by such measures as soil improvement and drainage, and enables the trees to reach a stage when they are relatively immune from attack by that species; it is doubtful, however, whether spraying older trees for the control of *C. piceae* would be justifiable economically in this country, although it is undoubtedly beneficial. In Britain the time has not yet arrived for thinning silver fir plantations for control of *Chermes*, and it is doubtful whether the intensive system employed in Denmark will be practicable.

THEOBALD (F. V.). **The Plant Lice or Aphididae of Great Britain. Vol. i.**—ix+372 pp., 196 figs. London & Ashford, Kent, Headley Bros., 1926. Price £1 1*s.* net.

This is the first volume of a monograph that is the result of 26 years' study of the Aphids of the British Isles. In naming the species reference has been chiefly made to Buckton's Monograph of British Aphides of 1875–1884. The original descriptions are quoted of all those species that appear to be valid, although the author has not seen them. In the case of Walker's species, the types of some of which are lost, only those that seem recognisable without the types are reproduced. The systematic aspect only of the APHIDAE is dealt with, except that what is known of the life-cycle of any species is included with its technical description. The PHYLLOXERIDAE, including the genera *Phylloxera* and *Chermes* (in the broad sense), are regarded as separate from the true Aphids and are not included. The classification largely follows that of Baker in America, which is considered the simplest and most rational, though any classification is as yet very uncertain.

The new species described are *Myzus laricellus*, on larch; *M. polyanthi*, on polyanthus, primrose, auricula, etc.; *M. erigeroniella*, on fleabane (*Erigeron acris*); *Rhopalosiphoninus pseudo-rumicis*, on docks; *R. lupulinus*, on hops and wild strawberry (*Fragaria vesca*); and *Amphorophora hieraceoides*, on *Hieracium* sp. New names are *Macrosiphum githargo* for *Siphonophora cichorii*, Buckt. nec Koch; *Capitophorus gillettei* for *Rhopalosiphum hippophaes*, Gill. nec Koch; *Myzus pseudolamii* for *Macrosiphum lamii*, Theo. nec v. d.G.; *Myzus veronicellus* for *Macrosiphum veronicae*, Theo.; and *Myzus neogei* for *M. gei*, Theo. nec Koch. *Neomyzaphis*, gen. n., is erected for *Aphis abietina*, Wlk.

THEOBALD (F. V.). **Notes on Insects feeding on Hops in 1925.**—*Entomologist*, lix, no. 756, pp. 129–130. London, May 1926.

The insects recorded from Kent, Sussex and Hampshire on hops include: *Macrosiphum solanifolii*, Ashm. (*gei*, Koch), causing the bine to flag, though the injury is less serious than that due to *Phorodon humuli*, Schr.; *Myzus chelidonii*, Kalt., attacking the shoots soon after they appear; *Typhlocyba lethicryi*, Edw., which had not previously been recorded on hops, but which did considerable damage by feeding on the leaves, the eggs being laid on the lower surface of the leaves and causing the veins to turn brown; *Euacanthus interruptus*, L., particularly abundant in East Sussex and Kent, most of the damage being done to the young bine; *Calocoris fulvomaculatus*, De G., occurring in destructive numbers; and *Vanessa io*, L. Tortricids were found for the first time feeding in numbers on hops, the most abundant species being *Tortrix* (*Cacoecia*) *rosana*, L., and *T.* (*C.*) *podana*, Sc.; others were *T.* (*Pandemis*) *heparana*, Schiff., and *T.* (*P.*) *ribeana*, Hb., the last on wild hops. The larvae of *Acronycta rumicis*, L., occurred in isolated cases, and in one garden *Notolophus* (*O*[*rgyia*]) *antiquus*, L., was found in numbers. The weevil, *Plinthus caliginosus*, F., is common in the larval stage on the roots.

[SPEYER (E. R.).] **Entomological Investigations.**—*Nursery & Mkt. Gdn. Ind. Devpmt. Soc. Ltd., Exptl. & Res. Sta., 11th Ann. Rept. 1926*, pp. 89–109, 2 refs. Cheshunt, Herts., 1926.

The life-history of *Tetranychus telarius*, L. (red spider) in greenhouses is summarised from data obtained in the course of investigations extending over several years [*cf.* *R.A.E.*, A, xi, 350; xii, 430; xiii, 371]. Its principal food-plants are cucumber, tomato, grape-vine, carnation, asparagus-fern [*Asparagus plumosus*], and beans, and, to a less extent, arum [*Richardia*] and rose. There are marked differences in the activity of the mites on different plants, and it is concluded that there are definite races adapted to living only on certain plants; this hypothesis would explain the fact that the periods of infestation differ on different plants. It is suggested that the increase of the mite on tomato in recent years may have been caused by the adaptation of a race feeding on some weed; tomatos grown in heavily infested cucumber houses rarely if ever become infested directly from the latter, although females taken during hibernation from tomato houses will breed readily on cucumber foliage. Foliage injury is caused mainly by the feeding of the adult females during oviposition.

The mites pass the winter in the adult stage, the majority becoming bright red and hibernating on foliage or in crevices, but probably not in the earth; they seldom become entirely dormant, and they can withstand severe frosts, but excess of moisture is fatal to them. A few individuals do not become red, but continue to breed slowly throughout the greater part of the winter. In January or February some of the red females that have hibernated begin to lay eggs, which develop slowly, producing adults most of which assume the red colour characteristic of the hibernating forms and enter a resting period; the few adults of the first generation that do not become red breed slowly until the middle of March, when their offspring, the adults of the second generation, behave similarly to those of the first. At the middle or end of March the plants are invaded by the hibernating forms, and the summer generations begin, although it is improbable that all hibernating individuals leave their winter quarters at this time. From the end of April to the middle of August breeding is continuous in cucumber houses, not less than two generations a month being produced. Towards the end of August there is a tendency for all stages to become reddish, and in cucumber houses some individuals attach themselves to silken ropes, on which some 50 or 100 may spin a cocoon; it is not known what happens to the cocoons. In tomato houses ropes and cocoons are not constructed, and preparation for hibernation may extend to the end of September.

The eggs are laid on the lower surface of the leaves, each being placed behind a puncture made by the mouth-parts of the female, and they are protected by silken webbing; they hatch in 4 to 7 days, and the resulting larvae are active for 1 day and then rest for 1 day, after which they change to protonymphs, in which stage the sexes can be differentiated ; the male protonymphs are active for 1½ days and then become adult after a resting period of 1½ days ; the female protonymphs have an active period of 1 day and a resting period of 1 day, and then become deuteronymphs, which, after a similar period, become adults. The life-cycle thus takes from 9 to 12 days for males and from 10 to 13 days for females, at the temperatures prevailing in cucumber houses. If fertilised the females do not lay eggs for at least 12 hours, and the progeny from the eggs is about 80 per cent. females and 20 per cent. males ; unfertilised females lay eggs soon after the last moult, and these eggs produce males only.

Two natural enemies of *T. telarius* have been observed, *viz.*, a mite that occurs rarely on cucumber foliage and the larvae of the Cecidomyiid, *Thecodiplosis persicae*, Kieff. ; the eggs of the latter are laid in the webs of *T. telarius*, and the larva spins a cocoon on the underside of a leaf ; it is very prevalent in tomato houses in September, too late in the season to control the pest.

The resistance of varieties of tomatos to *T. telarius* is discussed ; manurial treatments did not seem to affect the infestation, but vigorous, sappy plants with dark stems showed a marked resistance.

Further experiments in fumigating cucumber houses for the control of *T. telarius* by broadcasting naphthalene [*R.A.E.*, A, xiii, 371] have shown that to prevent scorching, it is essential that the atmosphere and the leaves should be kept damp throughout the fumigation ; under these conditions there is no danger even to young plants. It appears that there is no danger of injury to the roots resulting from the broadcasting of naphthalene on borders, and that malformation of fruit is due primarily to climatic conditions, although it may perhaps be aggravated by the fumes of naphthalene. Maintaining a persistent weak vapour of naphthalene in cucumber houses failed to control *T. telarius* and injured the plants. Smaller amounts of naphthalene than the usual 6 lb. to a 100 foot house were not effective ; a double quantity, used in a badly infested house, did not rid it entirely of *T. telarius*, as a few eggs survived the treatment, but it did not injure the plants, Naphthalene fumigation kills a large proportion of the eggs of *T. telarius*,and the date of hatching of those that survive shows that they are laid either shortly before or during fumigation ; eggs from 1 hour to 4 days old were fumigated and kept under observation, but although some retained their normal colour, all failed to hatch. The presence of powder in flake naphthalene is undesirable, as it tends to form lumps during storage ; dusting with naphthalene is not satisfactory. Sufficient control can be obtained by fumigating at intervals of about a month, but to kill all the mites in a house a second fumigation should be carried out from 6 to 10 days after the first.

For the control of *T. telarius* on tomatos the effect of volatilisation of naphthalene from fumigators was very uncertain, and least risk of injury was experienced from broadcasting grade 16 naphthalene at the rate of 1–2 oz. per square yard over the whole soil surface and keeping the ventilators closed during the following day ; it is, however, concluded that napthalene is not a suitable fumigant for tomato house conditions, on account of low temperatures, risk of damage through keeping ventilators closed during the day, and danger from mildew if warm, moist atmospheres are created. Dusting with various forms of sulphur and mixtures of these with naphthalene was not efficient, and dusting with nicotine up to 3 per cent. absorbed on calcium carbonate and magnesium carbonate gave no results.

Variations of the proportions of oatmeal, flour, and Paris green in the bait for woodlice [*R.A.E.*, A, xiii, 372] did not increase its effectiveness, but by substituting bran for oatmeal and flour excellent results were obtained. The bait, consisting of 1 lb. Paris green thoroughly mixed with 28 lb. dry bran, is broadcast over the whole surface at the rate of ½ oz. per square yard. For plants in pots a little bait should be sprinkled over each pot in addition to broadcasting under the staging. The bait should be used early in the season, before the woodlice begin to breed, as towards the end of the season they do not appear to feed upon the bran so readily. The chief advantage of this method of control is that the collars of the cucumber plants are not injured in any way by the bait. A severe infestation of cucumber houses by *Armadillidium vulgare*, Latr., which occurred in May, was controlled by two applications of the above bait; *A. speyeri*, Jackson, was apparently absent, but *Porcellio laevis*, Latr., and *P. rathkei*, Br., occurred in cucumber houses and were controlled by the bait.

The method of generating hydrocyanic acid gas from sodium cyanide and sodium bicarbonate for the control of *Trialeurodes vaporariorum*, Westw., in tomato houses has already been noticed [*R.A.E.*, A, xiv, 188].

As tetrachlorethane is sometimes used to control *T. vaporariorum* on chrysanthemums, the effect of its vapour on a number of varieties was tested by fumigating them in a house of 1,000 cu. feet capacity, using 10 fl. oz. of tetrachlorethane poured on the path. Many varieties were killed as a result of the treatment and others were severely injured. As *T. vaporariorum* seldom damages chrysanthemums, and appears only to collect on them at the approach of winter, fumigation with tetrachlorethane should be avoided, even with varieties that show no immediate damage as a result.

WARBURTON (C.). **Annual Report for 1925 of the Zoologist.**—*Jl. R. Agric. Soc. England*, lxxxvi, pp. 284-291. London, 1925. [Recd. June 1926.]

No insect pests were particularly prevalent during 1925. Owing to the activities of Ichneumonids, the adults of *Pieris brassicae* were uncommon near Cambridge and in several other districts. *P. napi* was abundant, and *Phlyctaenia* (*Pionea*) *forficalis* appears to be increasing on cabbages.

Halticus saltator appeared suddenly in isolated cases on potatoes and beans, causing the leaves to shrivel, and the bugs also occurred in large numbers on *Phlox*, without apparently causing any injury. Minor attacks of *Phytomyza pisi* (pea leaf-miner) were not uncommon, and this fly may do much damage if not controlled. A particularly bad infestation by cockchafer grubs was recorded from the neighbourhood of the New Forest, where roots of all kinds of plants were destroyed. Many complaints were received of outbreaks of *Pegomyia hyoscyami* var. *betae* (mangel fly). The eggs are laid in May and June on the lower surface of mangel and beet leaves. As the former is the preferred food-plant, it might be tried as a trap crop if planted in a ring around sugar-beet in districts where much damage is done.

With regard to fruit pests, attention is called to the need for protecting English grown cherries from fruit-flies (*Rhagoletis*) by restricting the importation of infested fruit. *Hoplocampa fulvicornis* (plum sawfly) again appeared in destructive numbers. All infested fruit should be shaken from the tree and destroyed. It may be possible to prevent the emergence of the adults by treating the soil under the trees against the cocoons.

Forest pests included *Coleophora laricella* (larch case-worm) and *Chermes laricis* on larch. The latter is usually controlled by cultural measures, but the use of paraffin emulsion is recommended for treatment on a small scale. The Tortricid, *Gypsonoma aceriana,* caused serious injury to *Populus alba,* though all species of poplar are subject to attack. The eggs are laid under the leaves in the summer. The larvae feed on the leaves until the autumn, when they bore into the shoot at the base of the leaf. Many shoots are killed and those that recover show a gall-like swelling and a conspicuous scar. Severe pruning early in June so as to prevent the emergence of the new brood of moths might be beneficial.

Xestobium rufovillosum (*tessellatum*) has been in evidence in a church in the Midlands ever since the bats were cleared out a few years ago. It is possible that many of the beetles were destroyed by the bats, as they crawled or flew to fresh places. A few bats have reappeared, and they are to be allowed to remain undisturbed.

MILES (H. W.). **Fruit Pests and Winter Control Measures.**—*Jl. Bath & West & Southern Counties Soc.*, xx (1925–26), pp. 53–71, 10 pls., 1 fig., 7 refs. Bath, 1926.

Among factors that have contributed to the increase of insect pests in Britain in the last century are changes in the character of agriculture ; in Lincolnshire the cutting down of trees and hedges has led to a serious decrease in the number of insectivorous birds, and the introduction of the little owl has accentuated this ; indiscriminate spraying reduces the numbers of natural enemies of injurious insects as well as of the pests themselves, with the result that if it is discontinued, the latter multiply very rapidly.

The type of an orchard has a considerable bearing on its insect pests and also on the measures that can be employed against them. The grass orchards so frequent in the West of England often suffer severely from insect attack ; rough trunks, overgrown with moss and lichen, provide suitable places for hibernation for many injurious insects, and the undisturbed grass at the roots of the trees is favourable to species that spend part of their life-cycle in the soil. When possible, pigs or young stock should be kept in grass orchards, so that the grass is kept short, and poultry are valuable in destroying injurious insects.

In view of the advantages of winter measures when practicable, the site and stage of hibernation of a large number of fruit pests, and the measures suitable for use against the various types are discussed. The importance of pruning, both to improve the health of the trees and to reduce the numbers of the insects that hibernate on the twigs, is emphasised. The type of damage caused to fruit by various insects is briefly described, so that the more important pests present in an orchard can be determined from the fruit harvested.

CABANTOUS (L.). **Les mouches du poirier.**—*Rev. Zool. agric. & app.*, xxv, no. 1, pp. 11–14, 1 fig. Bordeaux, January 1926.

The sawfly, *Janus* (*Cephus*) *compressus*, F., has so far been easily controlled by cutting the infested shoots of pears [*R.A.E.*, A, viii, 496]. During recent years, however, the new shoots thus produced have become infested by *Perrisia pyri*, Bch., one of the main objects of the pruning being thus defeated. The curled leaves infested by this Cecidomyiid should be collected and burnt [*cf. R.A.E.*, A, ix, 594].

PAILLOT (A.). **Contribution á l'étude des maladies à virus filtrant chez les insectes. Un nouveau groupe de parasites ultramicrobiens: Les** *Borrellina*.—*Ann. Inst. Pasteur*, xl, no. 4, pp. 314–352, 9 figs., 51 refs. Paris, April 1926.

This is an extensive review of the literature and personal observations on nuclear diseases of Lepidoptera. The characters of the genus *Borrellina* [*R.A.E.*, A, xiv, 150] are described.

MOREAU (L.) & VINET (E.). **La lutte contre la Cochylis et l'Eudémis. Comment orienter la défense du vignoble.**—*Progrès agric. & vitic.*, lxxxv, no. 21, pp. 495–498. Montpellier, 23rd May 1926.

The vine moths [*Clysia ambiguella*, Hb. and *Polychrosis botrana*, Schiff.] have been recently becoming more abundant in France. The various methods recommended for their control in the past are reviewed [*R.A.E.*, A, xiv, 214].

VAYSSIÈRE (P.). **Le problème acridien.**—*Matériaux Etudes Calamités*, ii, no. 8, pp. 352-360, 10 refs. Geneva, January–March 1926.

This is a further summary [*R.A.E.*, A, xiii, 531] of the information concerning the locust problem in different countries.

TRINCHIERI (G.). **Etat actuel de l'organisation de la lutte contre les sauterelles dans divers pays. Résultats d'une enquête internationale.**—131 pp. Rome, Inst. Internat. Agric., 1926. Price *Lires* 15.

The present status of locust control in various countries is reviewed, the information being supplementary to a monograph previously noticed [*R.A.E.*, A, v, 100].

International Yearbook of Agricultural Legislation 14th year (1924).—English edn., 1191 pp. Rome, Inst. Internat. Agric., 1925. Price 12*s.* 6*d.* [Recd. May 1926.]

Pages 643–720 of this yearbook are devoted to the legislation of 1924 that dealt with insects injurious to agriculture.

FAES (H.). **Le traitement cultural du** *Phylloxera*.—*Terre vaudoise*, xviii, no. 21, pp. 317-319. Lausanne, 22nd May 1926.

As a result of tests for the control of *Phylloxera* in Switzerland by injections of carbon bisulphide into the soil it was found that a dosage of 40 gms. per square metre, though injurious in hot dry summers such as that of 1923, did not cause any injury to the vines in a damp season, such as that of 1924, which favours the development of rootlets. In practice it is recommended that the carbon bisulphide be applied in the spaces between the rows at the rate of 10 gms. per square metre.

Dégâts causés aux Arbres fruitiers par les Chenilles des Phalènes hiémales.—*Terre vaudoise*, xviii, no. 22, pp. 338–339. Lausanne, 29th May 1926.

Considerable injury is caused to various fruit-trees, particularly cherries, by *Cheimatobia brumata.* The irregular results obtained by the use of adhesive bands are due to various causes, such as the use of unsuitable material or late application or to the bands becoming covered with male moths over which the females can crawl. It is recommended that a general co-operative campaign be started ; the infested trees should be marked, the sticky bands applied in the first week of October and followed in the winter by applications of soluble carbolineum (10 per cent.) to the trunk [*R.A.E.*, A, xiv, 118].

WÜLKER (G.). **Biologie der Blattwespen, besonders der wirtschaftlich wichtigen Arten.** [Biology of Sawflies especially those of economic Importance.]—*Intern. ent. Zs.*, xix, no. 47, pp. 374–376. Guben, 15th March 1926.

Pteronus (*Pteronidea*) *ribesii*, Scop., did considerable damage to gooseberry and currant bushes in Germany in 1924. The eggs are laid on the lower surfaces of the leaves, along the midrib. The larvae hatch in 7 to 9 days. They probably have 4 moults and are full-grown in 8 to 10 days, when they spin cocoons in the soil, from which the adults emerge after 10–15 days. There are possibly as many as 5 generations a year.

The larvae should be hand-picked, and the ground round the plants dug up and disinfected, especially before and during the appearance of the first generation. At this time also the bushes should be dusted or sprayed with a stomach poison, such as Urania green or Solbar (a mixture containing sulphur and barium), but these should never be applied during the four weeks immediately preceding the gathering of the fruit.

These poisons are also effective against the pine sawfly, *Lygaeonematus pini*, Retz., the eggs of which are laid in May in pine needles, at the ends of the young shoots, and take at least 4 days to hatch. The larvae have several moults and feed for 4–6 weeks before spinning a cocoon in the soil, where they remain as larvae until the spring ; they pupate and emerge as adults a few weeks later.

BLUNCK (H.) & LUDEWIG (K.). **Kann Fritschaden mittels Fangpflanzen verhindert werden ?** [Can Injury by the Frit Fly be prevented by Trap Plants ?]—*Georgine, land- u. forstw. Ztg.*, no. 25, reprint, 4 pp., 4 refs. Königsberg, 31st March 1926.

The value usually attached to the use of trap crops for *Oscinella frit* has been questioned by several workers. It was thought that the eggs deposited on such plants were destroyed by ploughing, but observations in Russia [*R.A.E.*, A, i, 399, 491] and England [A, ix, 205, 534] have shown that the flies are able to emerge from considerable depths.

The authors' observations, made in 1925 in Germany, proved that they can wander underground from plant to plant when forced to do so by lack of food. Furthermore they can travel from plants buried at a depth of 12 in. through clay soil that has been firmly stamped down, and reach the new crop and attack it very severely. The sowing of trap-plants in fields intended for winter crops attracts flies unable to oviposit elsewhere, and after being ploughed under the individuals thus collected are able, at least in their older stages, to reach the new crop. The same thing occurs with self-sown plants in fields destined for a winter-crop. Unless, therefore, there is a regular crop-rotation between stem crops and root crops, self-sown plants should be destroyed soon after they have appeared.

MERCET (R. G.). **Los géneros** *Chalcaspis* **How. y** *Eugahania* **nuevo (Hym. Chalc.).**—*Eos*, ii, no. 1, pp. 43–48, 2 figs., 4 refs. Madrid, 25th April 1926.

The new genus *Eugahania* is erected for *Bothriothorax fumipennis*, Ratz., a parasite of Coccids in Europe and Japan.

ROSS (W. A.) & HALL (J. A.). **The Rose Chafer.**—*Canada Dept. Agric.*, Circ. 44, 4 pp., 1 fig. Ottawa, April 1926.

An account is given of the bionomics and control of *Macrodactylus subspinosus*, F., in Ontario [*R.A.E.*, A, iv, 405 ; xiii, 577].

GLENDENNING (R.). **Some New Aphids from British Columbia.**—*Canad. Ent.*, lviii, no. 4, pp. 95-98, 1 fig. Orillia, Ont., April 1926.

The species described are *Betulaphis occidentalis*, gen. et sp.n., in colonies on *Betula occidentalis*; *Amphorophora arnicae*, sp.n., on *Arnica amplexicaulis* ; *Euceraphis sitchensis*, sp.n., on mountain alder (*Alnus sitchensis*) ; *E. variabilis*, sp.n., on *Sambucus racemosa* ; and *Macrosiphum caricis*, sp.n., on *Carex* sp.

DRIGGERS (B. F.). **The Blueberry Tip Worm** (*Contarinia vaccinii* **Felt), a new Species of Midge attacking cultivated Blueberries.**—*Jl. N.Y. Ent. Soc.*, xxxiv, no. 1, pp. 82–85. New York, March 1926.

Contarinia vaccinii, sp.n., here described by E. P. Felt, was first observed in the summer of 1921 in New Jersey in a nursey bed of blueberries. A second outbreak occurred in 1925, the injured tips being discovered in July. An examination of the partly opened leaf buds showed larvae on the inside of the young, loosely folded leaves. They feed on the inside of the bud and eventually kill it. Greenhouse and nursery conditions apparently favour the development of this midge, and in one greenhouse practically all the plants were infested between July and September.

The eggs are laid between the loosely folded leaves of the unfolding buds, where they are held in place by a sticky substance secreted by the female. The larvae enter the soil for pupation.

Glasgow (H.). **The Cabbage Maggot : its Control in the Seedbed.**—*N. Y. State Agric. Expt. Sta.*, Circ. 76 (revised), 20 pp.. 1 fig., 8 pls. Geneva, N.Y., 1st April 1926.

In this revised edition of a circular previously noticed [*R.A.E.*, A, xii, 329] the life-history and control of the cabbage maggot [*Phorbia brassicae*, Bch.] and the injury caused by it are described.

The information is based on the results of experiments reported on elsewhere [*R.A.E.*, A, xii, 396 ; xiv, 170].

Thorne (G.). *Tylenchus balsamophilus*, **a new plant parasitic Nematode.**—*Jl. Parasitology*, xii, no. 3, pp. 141–145, 2 pls. Urbana, Ill., March 1926.

Tylenchus balsamophilus, sp.n., is recorded from *Balsamorrhiza* spp. and *Wyethia amplexicaulis*. This Nematode is not known to be of economic importance, though it is of interest because it causes a new type of plant injury. The larval worms force their way into the tissues of the leaf, and by congregating in small groups, cause galls to develop as the leaf grows.

Spray Calendars for Apples and Quinces, Peaches, Plums and Cherries, and Grapes.—*New Jersey Agric. Expt. Sta.*, Circs. 180–183, 4,4,4, & 2 pp., 6 figs. New Brunswick, N.J., 15th February 1926.

These spray schedules for New Jersey supersede those previously noticed [*R.A.E.*, A, xii, 363 ; xiii, 384].

Wakabayashi (S.). **The Injurious Effect of Submergence on the Cranberry Plant.**—*New Jersey Agric. Expt. Sta.*, Bull. 420, 26 pp., 4 figs., 15 refs. New Brunswick, N.J., December 1925. [Recd. May 1926.]

These experiments were made to ascertain the causes of injury resulting from submerging cranberry plants at various times while in active growth. The injury following on flooding in August, or later in the season, a measure often recommended against insect pests [*R.A.E.*, A, xii, 326 ; xiii, 380, etc.], is chiefly due to the attacks of fungi, oxygen deficiency, which is an important factor in submergence earlier in the year, being of minor importance.

Entomology and Economic Zoology.—*Minnesota Agric. Expt. Sta., 32nd Ann. Rept. 1924*, pt. iv, pp. 25–29, 2 figs. St. Paul, Minn., March 1925. [Recd. May 1926.]

A short account is given of the seasonal history of *Empoasca fabae*, Harr. (*mali*, LeB.) on potatoes [*R.A.E.*, A, xii, 56]. Of the many sprays tried, the best results were obtained with liquid Bordeaux mixture containing 40 per cent. nicotine sulphate, 1 part to 800. For the control of the Colorado potato beetle [*Leptinotarsa decemlineata*, Say], lead arsenate may be added at the rate of 2 lb. to 50 U.S. gals. Four applications were made under high pressure by a machine using a four-row boom with 3 nozzles per row. The time of application varies with the season.

Details are given of a bait recommended for the control of grasshoppers [*R.A.E.*, A, xiii, 176].

A simple apparatus for fumigating with chloropicrin against clothes moths and other household pests is described and illustrated. It consists of a battery of atomisers connected with a tank of air under pressure. For the fumigation of a house several atomisers are placed in each room, and all are connected together and to the pressure tank, which is outside and under the control of the operator.

The chloropicrin required is mixed with an equal quantity of carbon tetrachloride as by this means it vapourises more quickly than when used alone. There is no danger to the operator or others, and the method has been successfully used in mills and elevators.

HASEMAN (L.), TURNER (N.), SULLIVAN (K. C.), DAVIS (G. L.) & JONES (E. T.). [**Miscellaneous Pests in 1924-25.**]—*Missouri Agric. Expt. Sta.*, Bull. 236, pp. 50–52. Columbia, Mo., January 1926. [Recd. May 1926.]

The Hessian fly [*Mayetiola destructor*, Say] did not occur in sufficient abundance to affect the yield of wheat, but an alarming increase of the wheat joint-worm [*Harmolita tritici*, Fitch] was recorded from south of the Missouri river. The strawberry crown borer [*Tyloderma fragariae*, Riley] was more injurious in various sections [*cf.* *R.A.E.*, A, x, 451].

In experiments for the control of pests of melons and related crops in greenhouses, the best results against the striped cucumber beetle [*Diabrotica vittata*, F.] were obtained with lead or calcium arsenate and lime or calcium arsenate and gypsum, whilst a nicotine dust or spray was satisfactory against the melon aphis [*Aphis gossypii*, Glov.].

GILLETTE (C. P.). **Report of the Entomologist.**—*38th Ann. Rept. Colorado Expt. Sta., 1925*, pp. 22–24. Fort Collins, Colo. [1926.]

Illinoia (*Macrosiphum*) *pisi* caused considerable damage to lucerne fields locally, but was otherwise less injurious than usual; *Eriosoma lanigerum* is almost universally present in apple orchards, but *Aphis* (*Anuraphis*) *sorbi* has almost disappeared as an apple pest from Mesa county, and very little damage was caused by *Aphis gossypii* in the melon growing sections. In spite of thorough spraying the codling moth [*Cydia pomonella*] continues to be responsible for serious apple losses. *Anabrus simplex* (mormon cricket) was less injurious than was expected. The poison distributed against grasshoppers gave universal satisfaction, the arsenic being used at double strength (2 lb. sodium arsenite to 100 lb. bran).

Epilachna corrupta (Mexican bean beetle) is increasing its area of infestation. In north-eastern Colorado some trees have been killed by the oyster-shell scale [*Lepidosaphes ulmi*], which is a serious pest of ash, willow, cottonwood [*Populus*] and purple lilac bushes. A severe outbreak of *Chorizagrotis auxiliaris* (army cutworm) occurred in the north-east of the State, but the loss to autumn grain, though severe, was too localised for this moth to rank as a major pest of the season.

GUYTON (T. L.) & KNULL (J. N.). **Mexican Bean Beetle in Pennsylvania.**—*Pennsylvania Dept. Agric.*, Gen. Bull. 417, 6 pp., 6 figs. Harrisburg, Pa., 1st December 1925. [Recd. June 1926.]

Epilachna corrupta, Muls. (Mexican bean beetle), which has recently (1924) spread into Pennsylvania, is now firmly established there. A brief account is given of its life-history and habits. The usual arsenical sprays and dusts recommended against this beetle [*R.A.E.*, A, xii, 395; xiii, 262, 329] have been tried and showed no scorching of foliage. Any magnesium arsenate that is used for dusts or sprays should not contain more than 0·5 per cent. of water soluble arsenic pentoxide or any calcium arsenate more than 0·2 per cent.

GUYTON (T. L.) & STEAR (J. R.). **The Peach Tree Borer and its Control.**—*Pennsylvania Dept. Agric.*, Gen. Bull. 418, 10 pp., 2 pls., 1 fig. Harrisburg, Pa., 15th December 1925. [Recd. June 1926].

This information on *Aegeria exitiosa* has already been noticed from a previous bulletin [*R.A.E.*, A, xii, 590].

[**Notes on Insect Pests in 1924-25.**]—*44th Ann. Rept. Ohio Agric. Expt. Sta., 1924–25*, Bull. 392, pp. 41–43. Wooster, Ohio, 1926.

Experimental work in connection with the control of the European corn borer [*Pyrausta nubilalis*, Hb.] is being continued. Owing to the importance of the length of the maize stubble left in the field, an apparatus is being devised, which when attached to the binders, will leave a stubble only 1–2 inches long. The distribution of the Mexican bean beetle [*Epilachna corrupta*, Muls.] was not widely extended in 1925; tick trefoil (*Meibomia canescens*) and other wild leguminous plants serve as food-plants for all stages.

A dormant spray of dry lime-sulphur was satisfactory against the San José scale [*Aspidiotus perniciosus*, Comst.] but not against the European red mite [*Paratetranychus pilosus*, C. & F.]; the latter was controlled by oil sprays at strengths recommended for scale control except in the case of engine oil emulsion, which needs a strength of 3 instead of 2 per cent.

Conifers have been found to be surprisingly tolerant to applications of standard strength dormant sprays in the spring before growth starts.

HOUSER (J. S.) & BALDUF (W. V.). **The Striped Cucumber Beetle,** *Diabrotica vittata* **Fabr.**—*Ohio Agric. Expt. Sta.*, Bull. 388, pp. 239–364, 27 figs., 169 refs. Wooster, Ohio, November 1925. [Recd. May 1926.]

Diabrotica vittata, F., is one of the most serious pests of cucurbits in the United States [*R.A.E.*, A, xi, 485], and in Ohio alone the loss due to this beetle is estimated at £10,000 a year. This very detailed account of all aspects of its bionomics and control is the result of three years (1919–21) observations in Ohio, where there are 2 full broods annually with a considerable overlapping of the generations. The hibernated beetles appear on cucurbits as early as 16th May, and many live up to the end of August. The adults of the next brood occur from about the end of June until September, the life-period being thus about 3 months, whereas the adults of the overwintering brood first appear in

August and live, as already stated, to the following August. In spite of this great difference in the length of life, the first generation is as numerous as the second, the beetles spending as much as 6 weeks in feeding and fattening for successful hibernation. They are inactive from about November to March, and in the spring feed again for about two weeks before reproduction begins. The duration of all stages from egg to adult is intimately connected with the humidity and temperature of their environment [*cf.* *R.A.E.*, A, xiv, 76].

A list is given of the food-plants of the adults ; among these soybean (*Glycine hispida*), dandelion (*Taraxacum* spp.), nettle (*Urtica gracilis*) and privet (*Ligustrum ibota*) are recorded for the first time. The food-plants belong mainly to the Cucurbitaceae, Leguminosae, Rosaceae and Compositae, the last two being chiefly wild plants. The preferred food-plants are cultivated cucurbits, to which *D. vittata* is responsible for three main types of injury. In the spring the adults eat the entire young plant ; later they feed on the newly unfolded leaves and especially on the underground part of the stem ; and when the blossoms open they form the chief food, many of the ovaries being ruined. In the autumn the beetles feed on the fruit, but as only over-ripe fruits or those injured by disease or frost while still green are attacked, the loss from this cause is very small.

The eggs are laid in the soil near the base of the plant, but may be found up to a foot away from the hill or on fibrous secondary roots of cucumber about an inch deep in the soil. The larvae feed mainly on the stems, into which they bore. They may also burrow up into small tender plants to almost two inches above the soil level. They are apparently confined to cucurbits for development. For pupation they burrow into the soil close to the point of feeding, the depth to which they do so depending largely on the moisture contained in the soil.

A classified list is given of all the known natural enemies, with details of the bionomics of those recorded from Ohio. The most important is a Tachinid, *Chaetophleps setosa*, Coq., which apparently deposits either an egg or a larva in the beetle host, *i.e.*, larvae are deposited if the beetles are not available by the time that the eggs hatch in the Tachinid. When mature the larvae emerge from the host at the juncture of the thorax and abdomen. During the active season, from about the middle of April to the middle of October, there are five generations of this Tachinid. It hibernates as a larva in the host.

Many of the adult beetles are killed by mature larvae of a Telephorid, *Chauliognathus pennsylvanicus*, DeG., which has two generations a year, the larvae being in the field at the same time as the pest. Other parasites are *Syrrhizus diabroticae*, Gahan [*R.A.E.*, A, x, 363], and the Nematode, *Howardula benigna*, Cobb [*R.A.E.*, A, x, 140].

Remedial measures are dealt with at length, the work of many authors being reviewed, with details of experiments in Ohio. Such measures include trap crops and other cultural practices, as well as the application of dusts and sprays, for which many formulae are given. Dusts are recommended in preference to sprays because they can be applied more rapidly and with inexpensive devices. The apparatus described consists of a half-gallon tin can with holes punched in the bottom and provided with a convenient handle. The operator walks down the row of plants, giving one shake of the duster to each hill of cucumbers, or two when the plants are larger. The dust recommended is calcium arsenate and gypsum, 1 to 20. The first application should be made when the young plants are coming through the soil, and one application a week should be sufficient during fine weather unless the plants are making very rapid growth. Applications may be discontinued after the vines are well developed.

HOUSER (J. S.). **Pumpkin Insects.**—*The Canner*, lxii, no. 10, Convention no., pt. 2, pp. 133–134. Chicago, 27th February 1926.

An account is given of the bionomics and control of some of the more important insect pests of pumpkins and other cucurbits. Those dealt with are the striped cucumber beetle [*Diabrotica vittata*, F.] [see preceding paper], *Epilachna borealis*, F. [*R.A.E.*, A, xii, 329], *Melittia satyriniformis*, Hb. [*R.A.E.*, A, xii, 244] and *Anasa tristis*, DeG. [*R.A.E.*, A, ix, 32].

Clean cultivation in the autumn and early spring planting are the most important measures against the last named pest; under field conditions, 40 per cent. nicotine sulphate, 1 part to 400 of water, may be applied to the lower surface of the leaves against the newly hatched nymphs.

HOWARD (L. O.). **A Great Economic Waste.**—*Natural History*, xxvi, no. 2, pp. 124-132, 17 figs. New York, 1926.

The insects are the worst rivals and enemies of man and are apparently better fitted than he is for existence on the earth. Many examples are shown of the toll taken by them from the various annual crops. In spite of the large sums allotted to fight such a serious menace, the funds available are only sufficient to cope with sudden insect outbreaks and to kill enough of the pests to allow the agricultural industries involved to continue with profit. The ultimate control, however, of these pests cannot be obtained without the application of further sums to research work, including such branches as the study of the senses of insects, their nutrition and diseases, and factors of temperature and humidity influencing them, as well as their correlation with each other.

It is suggested that there should be a permanent foundation for the study of the fundamentals of insect life. Such a foundation should organise a large group of the best trained men, who should be charged with the careful study of every phase of insect life, from the chromosome to the last reaction of the adult, throughout the enormous range of variation that exists in this now almost mysterious insect complex. With such knowledge, the control of insects may possibly prove to be a comparatively simple matter.

OESTLUND (O. W.) & HOTTES (F. C.). **A Chapter in the Life History of** *Mordwilkoja vagabundus* **(Aphididae).**—*Ann. Ent. Soc. Amer.*, xix, no. 1, pp. 75–80, 1 pl., 3 refs. Columbus, Ohio, March 1926.

Mordwilkoja vagabundus, Walsh, has been associated with galls on cottonwood (*Populus*). The authors' attention was called to the fact that old galls often contained in the autumn Aphids differing from those that originally inhabited them. Galls were collected from different localities and examined, the results showing that Aphids removed by from three to six generations from the ones that leave the galls early in the summer return to these galls after developing upon some unknown food-plant. These autumn migrants deposit sexual forms, which lay their eggs in small crevices on the inside wall of the gall. In this protected position the eggs remain until the following spring. The fact that the eggs are laid in these old galls explains why the same trees are infested year after year while others nearby are apparently immune from attack.

The various forms are described, and the original description is quoted.

Campbell (R. E.). U. S. Bur. Ent. **The Pea Aphis in California.**—*Jl. Agric. Res.*, xxxii, no. 9, pp. 861-881, 8 figs., 9 refs. Washington, D.C., 1st May 1926.

A detailed account is given of the bionomics of *Illinoia pisi*, Kalt. (pea aphis) as observed in California. Of the food-plants recorded most damage is done to garden, field and sweet peas, vetches and recently also lucerne.

In the mild climate of California there is a continuous series of generations of viviparous females, except in some of the inland or mountain regions, where as a result of the cold weather the winter may be passed in the egg stage. Temperature has a marked effect on the rate of growth and reproduction [*cf.* *R.A.E.*, A, xiii, 27]; while at 48–55° F. the total length of life varies from 35 to 60 days, it is only 13–18 days at 70–75° F. Beyond a certain point not definitely established, high temperatures are harmful.

An account is given of the various predacious and parasitic insects and fungi recorded as attacking this Aphid in California; as a rule they are of little importance in checking an infestation, though they may prevent a reinfestation after control measures have been applied.

Gentner (L. G.). **Some Important Grape Insects.**—*Michigan Agric. Expt. Sta.*, Spec. Bull. 148, 19 pp., 13 figs. East Lansing, Mich., October 1925. [Recd. May 1926.]

The life-history of *Polychrosis viteana*, Clem. (grape-berry moth) in Michigan is similar to that in northern Ohio and New York [*R.A.E.*, A, i, 112; iv, 190; xi, 234]. In 1924, which was an unusually cold season, there were only two broods; the first brood adults began to emerge in the last week of July, and almost all the larvae of the second brood had pupated by the first week of October. The cocoons are not always made on grape leaves, and some were observed on growing sassafras leaves and also on dead leaves. It has been suggested that the larvae of the second brood, on hatching, burrow directly into the fruit from the egg, but this is not the case. The following Hymenopterous parasites were reared from the larvae or cocoons of *P. viteana*; *Dioctes obliteratus*, Cress., *Microbracon* (*Habrobracon*) *gelechiae*, Ashm., *M. variabilis*, Prov., *Spilocryptus polychrosidis*, Cushm., and *Glypta mutica*, Cushm.; *Elachertus coxalis*, How., was seen trying to oviposit in a larva. These natural enemies are not, however, sufficiently numerous to control the pest. Satisfactory control may be obtained by spraying with 3 lb. powdered lead arsenate or 2 lb. powdered calcium arsenate in 100 U.S. gals. Bordeaux mixture containing 2 lb. resin fish-oil soap as an adhesive. The first application is made before the flowers open, the second just as the petals are falling, and the third just before the berries in the clusters touch one another.

Pseudococcus maritimus, Ehrh. (grape mealybug) is common on grapes in Michigan. The eggs of the first brood, which are laid beneath loose bark, scattered in masses of cottony strands, hatch in the early spring; the larvae feed mainly on the growing stems and the under sides of the leaves, and the adults appear at the beginning of July, when they move to the bark and the eggs are laid; these eggs begin to hatch in the latter half of July, and the adults of the second brood appear at the end of September and lay the eggs that hatch in the following spring. An ant, *Cremastogaster lineolata*, Say, occurs in association with *P. maritimus* and may be responsible for its spread to some extent. Control measures for *P. maritimus* are not at present necessary in Michigan, as it is kept in check by natural enemies, the Chalcid, *Pseudaphycus angelicus websteri*, Timb., and the Coccinellid, *Hyperaspis undulata*, Say, which feeds on the eggs and young larvae.

Erythroneura (*Typhlocyba*) *comes*, Say (grape leafhopper) and *E.* (*T.*) *tricincta* var. *cymbium*, McAtee (three-banded grape leafhopper) are sometimes very injurious to grapes in Michigan; their life-histories are similar [*R.A.E.*, A, xii, 168], but *E. tricincta* var. *cymbium* appears somewhat later than *E. comes*; in 1924 there was apparently a partial second brood of both species. The Dryinid, *Aphelopus comesi*, Fenton, is an important parasite of *Erythroneura*, laying its eggs in the larvae; and a mite, *Anystis agilis*, Banks, and a bug, *Hyaliodes vitripennis*, Say, are predators. For the control of these leafhoppers 1 pint of 40 per cent. nicotine sulphate should be added to every 100 gallons of the third spray for *Polychrosis viteana*; leaves and rubbish round vineyards should be burned in the late autumn or early spring, preferably on a cold day, when the leaf-hoppers hibernating in them are inactive.

Mines in grape leaves containing larvae of the Tineid, *Antispila isabella*, Clem., were found in August; when full grown, the larva makes an oval cut through both surfaces of the leaf and spins a cocoon between the two pieces of leaf, which fall to the ground, where it pupates. Fresh mines were found in September, and the larvae of this brood passed the winter in the cocoons, pupating in the following spring. If control measures are necessary, it should be sufficient to turn the cocoons into the earth in the spring; the destruction of wild grapes in the vicinity of the vineyards would also be useful, as in the control of other grape pests.

Reticulitermes flavipes, Kol., is common in dead wood in vineyards, and was found also on a number of occasions tunnelling in the heartwood of living trunks of grape vines, where it apparently did not cause much injury. A predacious thrips, *Leptothrips mali*, Fitch, was found commonly on grape vines throughout the season, where it fed probably on other thrips, mites, and Aphids, and possibly also on *Pseudococcus maritimus*.

NELSON (E. W.). **Bats in Relation to the Production of Guano and the Destruction of Insects.**—*U.S. Dept. Agric.*, Dept. Bull. 1395, 12 pp., 4 figs., 4 refs. Washington, D.C., March 1926.

This bulletin deals principally with the Mexican free-tailed bat (*Tadarida mexicana*), a species that lives in large colonies in Mexico and the south-western United States. The food of this bat, so far as is known, consists entirely of insects, almost all night-flying species, and chiefly moths and beetles, of which it is believed to consume a quantity equivalent to half its own weight in a single night. Other bats in other parts of the United States that do not live in colonies have probably a similar food capacity, and where they exist in sufficient numbers, they may well have an economic value comparable to that of insectivorous birds.

HAMLIN (J. C.). **Biological Notes on Important *Opuntia* Insects of the United States.**—*Pan-Pacific Ent.*, ii, no. 3, pp. 97–105, 2 refs. San Francisco, Cal., January 1926. [Recd. May 1926.]

This is a continuation of a previous study of *Opuntia* insects in the United States and Mexico [*R.A.E.*, A, xiii, 508]. *Mimorista flavidissimilis*, Grote, the stages of which are described, deposits eggs singly or in small groups on newly formed joints, generally near the upper edges, the incubation period lasting from 3 to 5 days. The larvae spin a web, beneath which they feed, either singly or several together, and pupate on the joints. In midsummer, a generation is produced in 4 weeks, and in some localities as many as 8 generations may occur annually ; in the south the last generation shows retarded development lasting over the mild winter, while in the north the winter is passed in the pupal stage. An Ichneumonid, probably *Casinaria infesta*, Cress., is a fairly common parasite, a less abundant one being *Eiphosoma bruesi*, Cush.

Dactylopius tomentosus, Lam., and *D. confusus*, Ckll., which have very similar bionomics, are important enemies of *Opuntia*. Several generations are produced during the summer, some requiring only 5 to 7 weeks. The last settles in sheltered places for the winter, the over-wintering insects living on the roots or stems beneath the surface of the ground or close to the ground on fallen joints. The summer generations travel upwards and cluster on the top spines of the plant, checking the new growth ; at this time they are probably disseminated over considerable distances by wind. *D. tomentosus* has been found only on *Opuntia*, but in the field there are distinct biological strains on certain species that can only adapt themselves with difficulty to others. Besides the many known enemies of these Coccids, the author has found *Zophodia quadricolorella*, Dyar, to be a most important predator, the larvae burrowing beneath the waxy covering of the cochineal clumps and devouring the soft-bodied Coccids.

The Cecidomyiid, *Asphondylia opuntiae*, Felt, has one generation a year, and the larvae are retarded in development, showing no change for about nine months. Although not appearing to enter the seeds or fleshy interior of the fruit, the attack of these midges has the effect of inhibiting development of the seed, possibly owing to a secretion. The Longicorn, *Moneilema crassa*, Lec., deposits eggs either on the plant or at the point of contact of earth and plant. Various species of *Opuntia* and *Echinocereus* are attacked, the adults feeding on the young tender joints or on the fruit and older joints. As feeding takes place at night, the adults can be collected between dawn and about 8 a.m. The larvae enter the plant just below the surface of the soil, and pupation occurs in the earth a little lower down. There are two generations annually in Texas, adults appearing in April and again in September and living 2 to 3 months during the summer. An egg parasite of *M. crassum*, *Oencyrtus moneilemae*, Gahan, has been observed in cages.

MASON (A. C.). U.S.Bur. Ent. **Two new Species of Thrips from California.**—*Pan-Pacific Ent.*, ii, no. 3, pp. 155–157. San Francisco, Cal., January 1926. [Recd. May 1926.]

One of the species described is *Zygothrips californicus*, sp. n., taken on an orange tree in California.

Flanders (S. E.). **Notes on Parasites at Saticoy, California, during the Year 1925.**—*Pan-Pacific Ent.*, ii, no. 3, pp. 157-158. San Francisco, Cal., January 1926. [Recd. May 1926.]

These notes include the following records: a Braconid of the genus *Monogonogastra* from a walnut twig containing dead larvae of *Polycaon confertus*, Lec.; the Chalcid, *Zatropis tortricidis*, Crawf., reared from the lima-bean pod-borer, *Etiella zinckenella*, Treit., this parasite pupating free in the pod and passing 17 days in the pupal stage; *Epiurus* sp. (possibly *Pimpla albipes*, Cress., described from Mexico) and *Elachertus* sp., both reared from *Tortrix* (*Archips*) *argyrospila*, Wlk.; *Aphelinus perpallidus*, Gahan, parasitising the walnut aphis, *Chromaphis juglandicola*, Kalt.; and an Ichneumonid, *Exetastes* sp., and the Tachinid, *Lixophaga* sp., from overwintering larvae of the codling moth [*Cydia pomonella*, L.], the larvae of the Tachinid pupating within 12 hours after leaving the caterpillar and the pupal stage lasting about 20 days.

Ackerman (L.). **The Physiological Basis of Wing Production in the Grain Aphid.**—*Jl. Exptl. Zool.*, xliv, no. 1, pp. 1–61, 2 figs., 2 pp. refs. Philadelphia, Pa., 5th April 1926.

Approximately 20,000 grain Aphids, *Rhopalosiphum prunifoliae*, Fitch, were raised under controlled conditions to determine the effects of environmental influences on wing production. It was found that individuals reared at temperatures of 14–16° C. [57·2–60·8° F.] and 24–26° C. [75·2–78·8° F.] were more likely to be winged than at 12° C. [53·6° F.] or 18–20° C. [64·4–68° F.]. It was also found that when Aphids that had been at a particular temperature for several generations were transferred to a new temperature, they produced a higher percentage of winged forms during the first two or three weeks than was the case later on. Winged parents were much less likely than wingless ones to produce winged offspring. The offspring of wingless parents showed a very pronounced increase in wing production when the parents were removed from their food-plants for a period of 15 or 16 hours, or when the food-plant was allowed to become heavily infested with Aphids. The offspring of wingless parents, reared on plants that were weak from lack of sunlight, were all wingless. The offspring of winged parents showed a slight decrease in wing production when the parents were removed from the food-plant for 15 or 16 hours, but when the offspring of such parents were allowed to become overcrowded, a slight increase in wing production occurred.

In experiments with Aphids reared on plants growing in various salt solutions, salts, as components of the food of Aphids, were not found to have an effect on wing production.

A study was made of various characters that are strongly correlated with wing production and also of the haemolymph of these Aphids.

Pink Bollworm Quarantine (Domestic). Pink Bollworm Situation.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, Service & Regulatory Announcements, no. 85, October–December 1925, pp. 84–89, 2 maps. Washington, D.C., May 1926.

The situation as regards pink bollworm [*Platyedra gossypiella*, Saund.] in Texas in 1925 is discussed, with sketch maps showing the districts infested in 1920 and 1925. Inspection carried out during 1925 indicates that the areas originally invaded in eastern Texas and in Louisiana have remained free from the pink bollworm. Since it has not been found now in these districts for four or more years, it appears to have been eradicated.

In western Texas and New Mexico during the end of 1925 there was an unexpected increase of the pest, possibly owing to lack of early frosts in the winter of 1924–1925, and it has not been possible to take radical measures to eliminate it.

The reappearance of the bollworm throughout the western areas, and especially the great increase of it in the Big Bend area, makes very serious the outlook for the general control project. The protection hitherto ensured from the natural isolation of these areas from the continuous cotton culture of central and southern Texas, by a fairly wide semi-arid area free from any cotton, is gradually diminishing, the cultivation of cotton being constantly pushed westward from central Texas, until the non-cotton area is now in some places less than 50 miles wide. More drastic control of movement and of road inspection is required, and, if possible, the maintenance of a non-cotton zone. Regulations are enforced, by proclamations of August and November 1925 to ensure that all cotton and cotton products in infested areas are given vacuum fumigation prior to movement interstate out of these areas, and to prohibit the movement of cotton seed from them.

The damage due to *P. gossypiella* in Mexico for the crop year 1925 was greater than that in any previous year. The estimated percentage of the cotton crop that was non-pickable in the Laguna of Mexico in 1925 was 31·8, as compared with 7·18 in 1924.

ANDRES (A.). **Etwas über den roten Kapselwurm.** [Notes on the Pink Bollworm.]—*Ent. Zs.*, xl, no. 2, pp. 49–52. Frankfort-o.-M., 16th April 1926.

This is a review of the problems connected with the recent spread of *Platyedra gossypiella*, Saund., throughout the cotton-growing regions of the world.

FERNALD (H. T.). **Applied Entomology An Introductory Text-Book of Insects in their Relations to Man.**—2nd edn., xiv+395 pp., 388 figs. New York & London, McGraw-Hill Pubg. Co., 1926. Price $3.50.

In this second edition of this work [*R.A.E.*, A, x, 82] the chapter on Hymenoptera has been re-arranged to bring it more nearly in accordance with Comstock's "Introduction to Entomology." A chapter has also been added dealing with animal pests that are not insects, but with which the entomologist is generally expected to cope.

URICH (F. W.). **Progress Report.**—*Trinidad & Tobago: Minutes & Proc. Froghopper Investig. Comm.*, pt. 2, pp. 38–39. Trinidad, April 1926.

The eggs of the sugar-cane froghopper [*Tomaspis saccharina*, Dist.] appear to be usually laid in the dampest situation available, regardless of its nature; four females placed in a cage containing damp clay and slightly damp cane trash laid all but six of their eggs in the clay. Eggs laid in earth hatched in 20 days, the moisture content of the soil at the time of hatching being 21·78 per cent.; eggs removed from earth and placed in damp blotting paper were only ready to hatch after 42 days. Nymphs found on savannah grass (*Paspalum compressum*) in a field of plant cane produced adults that fed on the cane.

WITHYCOMBE (C. L.). **Froghopper Blight.**—*Trop. Agriculture*, iii, nos. 5–6, pp. 96-97 & 120–121, 6 refs. Trinidad, May–June 1926.

This paper forms the first of a series intended to deal more adequately with details concerning *Tomaspis* (*Monecphora*) *saccharina*, Dist., and its control in Trinidad than has already been done [*R.A.E.*, A, xiv, 186].

In destroying the nymphs as they come to the soil surface there is a distinct advantage on the side of dusts in the matter of application. Of these, calcium cyanide proved the most effective, though it would seem that in order to destroy all the nymphs, application would have to be made too frequently to be economically practical. The injection of fumigants to kill the nymphs below ground also does not seem worth while. Some success has been obtained with certain pyridine mixtures that can be watered into the soil. A mixture of pyridine and soap will emulsify from 1 to 5 times its volume of carbon tetrachloride, carbon bisulphide, dichlorobenzene or other fumigant, and can be diluted with water in any proportion. It is a valuable insecticide, particularly with carbon tetrachloride, though experiments on a large scale are needed before any recommendations can be made.

For the control of the adults, spraying is not possible under local conditions; dusts would have to be used, and these to be effective would have to evolve poisonous fumes so as to act directly as a respiratory poison. The best method of application would probably be from aeroplanes.

Calendario de patalogía vegetal y zoología económica, I. Plagas de origen animal (Insectos, Acaros, etc.).—*Argentina: Minist. Agric.*, Circ. 601, pp. 1–24, 6 pls. Buenos Aires, 8th April 1926.

The agricultural pests common in Argentina are listed according to the season of the year, with brief notes on their habits and control. Spring pests include the mite, *Tetranychus telarius*, on lucerne; the blister-beetle, *Epicauta adspersa*, on potato, tomato, beet, spinach, etc.; the locust, *Schistocerca paranensis*; the Lepidoptera, *Hylesia nigricans* on fruit-trees, *Cydia pomonella* on apple and pear, *Alabama argillacea* on cotton, *Papilio thoas thoantiades* on *Citrus*, and *Heliothis obsoleta* on tomato, maize, tobacco, cotton, etc.; and the Aphids, *Myzus amygdali* (*Anuraphis persicae*) on peach, *Anuraphis helichrysi* on cherry, *Aphis gossypii* on cotton, *Toxoptera aurantii* on *Citrus*, and *Eriosoma lanigerum* on apple.

The pests injurious in summer are *Epilachna* (*Solanophila*) *paenulata*, attacking Cucurbitaceae; *Dysdercus ruficollis* on cotton; *Caliroa cerasi* (*limacina*) on cherry and pear; *Eriophyes erineus* on walnut; *Gargaphia subpilosa* on vegetables, cotton, etc.; *Epitrix parvula* on potato, tomato and tobacco; and *Pseudosarbia phoenicicola* on palms.

Pests troublesome in autumn are *Psylla pyricola* on pear; and the Coccids, *Chrysomphalus dictyospermi*, *C. aonidum*, *Lepidosaphes beckii*, *Saissetia oleae* and *Mesolecanium deltae*, all infesting *Citrus*.

Winter pests include the mites, *Bryobia praetiosa* on fruit-trees, *Eriophyes pyri* on pear and *E. vitis* on grape-vine; the Coccids, *Aulacaspis pentagona* on peach, cherry, etc., *Aspidiotus hederae* on olive and ornamental plants, *A. perniciosus* on fruit and forest trees, and *Ceroplastes rusci* on fig; the ant, *Acromyrmex lundi*, on various plants; *Oeceticus kirbyi* (*platensis*) on fruit, forest and ornamental trees; *Colias lesbia* on lucerne; *Phytometra* (*Rachiplusia*) *nu* and *Lycophotia margaritosa* on flax; *Cirphis* (*Heliophila*) *unipuncta* on cereals; *Platyedra* (*Pectinophora*) *gossypiella* on cotton; and *Diloboderus abderus* attacking the roots of cereals and vegetables.

CAMINHA FILHO (A.). **Relatorio do mez de setembro de 1925, do auxiliar de inspector agricola de Defesa do Café, na zona da Matta.** [Report for September 1925 of the Assistant Agricultural Inspector of the Coffee Protection Service in the District of Matta.]—*Bol. Minist. Agric., Ind. e Comm.*, xv, (i) no. 2, pp. 122–127. Rio de Janeiro, February 1926.

Injury believed to be due to *Stephanoderes hampei*, Ferr. (*coffeae*, Hag.) was ascertained to be caused by *S. seriatus*, Eichh., and by the weevil, *Araecerus fasciculatus*, DeG. The Coccids, *Coccus viridis*, Green, and *Pseudococcus citri*, Risso, and the termite, *Eutermes ripesti*, Rambur, also occur on coffee in the district.

DE FLEURY (P.). **Etude sur les Lépidoptères producteurs de soie de l'Afrique occidentale française.**—*Bull. Com. Etudes hist. & sci. Afr. occ. fr.* viii, no. 4, pp. 544-558. Paris, October–December 1925. [Recd. May 1926.]

An account is given of *Anaphe ambrizia*, Butl. (?), in French West Africa, the information being substantially the same as that previously noticed [*R.A.E.*, A, xiv, 119]. A list is given of the species of *Anaphe* occurring in Africa, with their local distribution.

DE PEYERIMHOFF (P.). **Les Coléoptères des Euphorbes dans le Maroc occidental (Troisième note).**—*Bull. Soc. Sci. nat. Maroc*, v, no. 4–5, pp. 153-154, 1 pl. Rabat, 31st July 1925. [Recd. May 1926.]

This third note [*R.A.E.*, A, xiii, 454] deals with a Curculionid, *Acalles* (*Calacalles*) *theryi*, subgen. et sp.n., described from Mogador in dead wood of *Euphorbia*.

ISKANDER (Negrib). **Report on a Mission to California (U.S.A.) to study New Methods of Fumigation of Citrus Trees.**—*Minist. Agric. Egypt*, Tech. & Sci. Serv., Bull. 62, 41 pp., 7 figs., 4 refs. Cairo, 1926.

A short account is given of the Coccids attacking *Citrus* in California, with a list of those recorded from Egypt, of which *Aspidiotus cydoniae*, Comst., is additional to those previously noticed [*R.A.E.*, A, xii, 427].

The properties, preparation, application and cost of liquid hydrocyanic acid gas in California are described in detail. A comparison of this method with the pot method of generating the gas, with a view to substituting it for the latter as at present used in Egypt, has shown that very little, if any, economy would be realised.

From April to October the midday temperature in Egypt is over the boiling point of the gas (80° F.) on more than half of the days in each month, and even in January, the coldest month in the year, the temperature may rise above boiling point. As the gas should be kept at a temperature of 60° F., special lorries with ice are needed to keep the liquid cool during transport. The agricultural roads are not so good in Egypt as in California and are not suitable for lorries to go everywhere to reach every garden in the shortest possible time under favourable conditions. The additional expenses incurred in storage and handling, which require great attention, would prevent any economy as compared with the pot method.

The use of calcium cyanide dust under a tent is discussed. Should this prove satisfactory and cause no injury, it would be the best method to introduce into Egypt and would be more economical than the pot method. This dust is being imported, and experiments will have to be made before a final decision can be given.

JACK (R. W.). **Outbreak of Army Worm** (*Laphygma exempta*, **Wlk.**).—*Rhodesia Agric. Jl.*, xxiii, no. 5, pp. 416–422; also [*S. Rhodesia*] *Minist. Agric. & Lands*, Bull. 593, pp. 1–9. Salisbury, May 1926.

In southern Rhodesia outbreaks of *Laphygma exempta*, Wlk. (mystery worm) occur roughly every 4–5 years. They generally take place just after the rainy season, but in no particular month. A peculiar feature of this Noctuid is the fact that the second generation is never found in appreciable numbers in the locality infested by the first. This is possibly due to migration of the adults before oviposition, though this has not been proved.

In the veldt swarms may be successfully controlled by spraying with ordinary unsweetened locust poison (sodium arsenite solution), but this cannot be applied to infested crops. The poison bait recommended in South Africa is quoted [*R.A.E.*, A, viii, 412]. Preliminary experiments tended to show that the sweetening material in this bait does not apparently increase its attractiveness. It is always best, however, to prevent the infestation of crops by treating the surrounding veldt as in the case of locusts.

The activities of Tachinid parasites are limited, owing to the appearance of the second generation in fresh localities. The storks, *Ciconia alba* and *Abdimia abdimii*, destroy large numbers of the larvae, but unfortunately do not visit the fields until most of the damage has been done.

MILLER (D.). **Forest and Timber Insects in New Zealand.**—*New Zealand State Forest Serv.*, Bull. no. 2, 76 pp., 3 maps, 169 figs., 41 refs. Wellington, N.Z., 1925. [Recd. May 1926.]

This bulletin is a preliminary account of the insects infesting indigenous and exotic forest trees and their products in New Zealand. In Part i the topography and climate are discussed, and the conditions of the forests and their relations with regard to insects are described. The control of forest pests is considered to be a question of prevention, dependent upon the factors of natural enemies, forest management, and in the case of boring insects, the protection of timber, by substituting hardwoods for softwoods where feasible, by using seasoned wood treated with creosote, by avoiding the use of infested wood and removing accumulations of disused timber, by storing timber in stacks open to thorough ventilation, and by destroying infested wood wherever possible. The characters of the insects associated with forestry, both injurious and beneficial, are discussed. In Part ii a brief account is given of the chief insect pests of the forests and of their habits, and in the form of appendices are a food-plant index and a list of the principal indigenous forest trees and shrubs.

New Zealand Department of Agriculture Annual Reports for 1923–24 and 1924–25.—26 & 32 pp. Wellington, N.Z., 1924 & 1925. [Recd. May 1926.]

The report of the Horticultural Division by J. A. Campbell includes a paragraph on imported fruit and plants. Fumigation was necessary in a number of shipments found to be infested with Coccids. Several consignments of almonds were badly attacked by *Plodia interpunctella*, Hb. (Indian meal moth), and of bulbs by the bulb-mite [*Rhizoglyphus hyacinthi*, Boisd.].

The following notes are taken from the reports of A. H. Cockayne. The distribution of *Cryptolaemus* [*montrouzieri*, Muls.] for the control of *Pseudococcus* has been carried out successfully. The reports regarding the utility of this Coccinellid in the field are very favourable, and it has become established at certain points, where it has survived a winter. Definite results have been obtained with the experiments in soil fumigation with calcium cyanide against the pear midge [*Perrisia pyri*, Bch.] [*cf. R.A.E.*, A, xiii, 404], and it is now being tried against other insect pests.

Leafhoppers [*Typhlocyba australis*, Frogg.] occurred in alarming abundance in the orchards during 1923-24.

The life-history of the gum-tree scale [*Eriococcus coriaceus*, Mask.] on *Eucalyptus* has been worked out, and the distribution of its natural enemy *Rhizobius* [*ventralis*, Erichs.] has resulted in a marked improvement in infested plantations and shelter belts.

Fighting the Codling Moth. Apple Juice and Vinegar Solutions.—*Fruit World of Australasia*, xxvii, no. 2, pp. 68-69. Melbourne, 1st February 1926.

R. Fowler reports on experiments in trapping the codling moth [*Cydia pomonella*, L.] in South Australia with a 50 per cent. solution of apple juice (fermented juice of rotten apples) and with a 25 per cent. solution of vinegar [*cf. R.A.E.*, A, xiii, 125]. The solutions were placed in 2 lb. containers suspended in the middle of the trees and were kept in position for about a month; during this time over 800 codling moths, of which it is estimated that 40 per cent. were females, were trapped in 47 containers. The two solutions appeared to be almost equally effective.

A note by G. Quinn briefly describes experiments in trapping *C. pomonella* with syrup and apple pulp in glass containers in South Australia in 1897.

J. H. Lang describes tests in Victoria with fermented apple juice and 10 per cent. vinegar solution, which were equally effective. It appears that the lures attract moths from considerable distances.

Numbers of the light brown apple moth [*Tortrix postvittana*, Wlk.] were captured in the traps, as well as a few beneficial insects.

Thomas (P. H.). **Control of Red Spider.**—*Fruit World of Australasia,* xxvii, no. 4, pp. 188-189. Melbourne, 1st April 1926.

Bryobia praetiosa, Koch (*pratensis,* Garm.) has become increasingly troublesome on apple in certain districts of Tasmania, causing injury to the fruit buds as they are forming to produce the next season's crop. The mites are found in colonies on the lower surface of the leaves. The eggs are laid in the crevices of the bark in the autumn and hatch as soon as the spring foliage appears. The principal damage is done in early summer by the mites puncturing the leaves and sucking out the sap. From experiments conducted during the summer and winter, it is evident that efficient control can only be obtained by the application of a dormant spray, for which oil emulsion containing 10 per cent. oil is recommended. This proved more effective than weaker mixtures or those containing lime-sulphur (1-8, 33° Bé. test). For summer treatment oil emulsion (1–60), nicotine sulphate (1 pt. to 50 gals.) and atomic sulphur (1 lb. to 12 gals.) were tried. The results with nicotine sulphate were very disappointing, even at a strength of 1 pt. to 30 gals. The atomic sulphur gave the best results, but summer treatment should not be relied upon.

Newman (L. J.). **The Green Tomato Bug** (*Nezara viridula,* **Linn.**).—*Jl. Dept. Agric. W. Australia,* (2) iii, no. 1, pp. 68-75, 7 figs. Perth, W.A., March 1926.

Nezara viridula, L., is now established in Western Australia and is likely to prove a serious annual pest of plants and fruit. It feeds on a large number of crops. The eggs are laid in the spring in clusters, usually on the foliage, and hatch in 8-10 days. The bugs may be active in September, but as a rule they do not emerge from their hibernating quarters until about the middle of October. The attacked fruit shows dead patches under the skin, the actual result of injury varying with the crop attacked, but in all cases the fruit is either unsaleable or at least second grade. As the bugs live for several months, one individual may be responsible for the loss of several bushels of fruit. The only natural control to be depended on is climate ; with the advent of the cold weather about the end of April or May the adults and some nymphs seek places of shelter for hibernating, and these may be provided in the field and then burnt. Other measures are the collection of eggs and the use of various sprays such as kerosene or other oil emulsions or the following home-made mixtures : 1 qt. phenyle, 3 lb. washing soda, 1 bar yellow soap and 40 gals. water ; 8 oz. soap, 8 tablespoonfuls turpentine and 4 gals. water ; and 16 oz. soap, ½ lb. cresylic acid and 10 gals. water. In each case the soap is dissolved in boiling water, and the other ingredients are then added, finally making the total up to the amount stated. The turpentine mixture should be applied whilst hot. It is not advisable to apply any of these mixtures to fruit or vegetables within 3 weeks of picking or cutting, as they are likely to impart a disagreeable flavour and odour. The bugs must be thoroughly coated with the spray, which is only effective against the immature stages, as the adults are practically immune from treatment of this kind owing to their wings forming a waterproof covering over the spiracles. Treatment should, therefore, be begun in the spring as soon as the pest is noticed. The bugs readily fall to the ground when disturbed and can best be sprayed in that position. Early morning or late afternoon is the best time for applying sprays.

Crops such as tomatos should be well staked to allow plenty of room between the rows, thus avoiding shelter for the bugs and making spraying easier.

NEWMAN (L. J.). **Fruit-fly. Winter Trapping Experiments.**—*Jl. Dept. Agric. W. Australia,* (2) iii, no. 1, p. 105. Perth, W.A., March 1926.

Winter trapping experiments against fruit-flies [*Ceratitis capitata,* Wied.] have been made with three proprietary preparations, two of which proved more efficient than pollard, borax and water [*R.A.E.*, A, xiii, 411].

The comparatively low capture recorded with the pollard home-made lure is attributed to the fact that this lure acts as a sex stimulus, and that during the months over which the test was applied (29th April–1st September, 1925) there is little or no mating of fruit-flies, the fertilised overwintering females being mostly in evidence. These females are, therefore, not readily attracted to the lure, but fall victims to the traps containing a tempting food. As a lure during the breeding season of the fly, from September to May, the pollard mixture is effective. Every fly captured in the winter and spring reduces the early summer attack, and any baits that will accomplish this purpose are strongly recommended.

COTTRELL-DORMER (W.). [**Sugar-cane Pests in the Districts of Proserpine and Mackay.**]—*Queensland Agric. Jl.*, xxv, pt. 4, pp. 312-319, 12 figs. Brisbane, 1st April 1926.

Serious damage to young sugar-cane in several districts has been caused by the larvae of a Chrysomelid, *Rhyparida limbatipennis,* Jac., feeding on the sets, shoots, and roots from July to November. The adults appear from October to December and feed on the foliage of the she oak (*Casuarina*), apparently exclusively. They may be found in large numbers at the bases of the leaves of these trees during the summer and autumn, and according to H. Hacker, occur commonly under the bark of *Eucalyptus* trees during the winter. The life-history has not been worked out, but it seems probable that one brood hibernates in the egg stage or as young larvae, in which case leaving the land fallow or growing a crop likely to be distasteful to them, in the autumn, might effect some control. In one locality it has been decided to cut down all she oaks, but it is suggested that it might be more advantageous to leave certain trees on which the beetles would concentrate, and which could be sprayed.

Severe damage has been caused to sugar-cane on one farm by the Stratiomyiid, *Metoponia rubriceps,* Macq., the larvae of which feed in the soil at the bases of the stools. Mosaic disease of sugar-cane has increased very rapidly in the last two years ; to prevent the spread of this disease it is essential that maize and *Sorghum*, which serve as hosts both for the disease and for its vector, *Aphis maidis*, Fitch (corn aphis), should not be grown in the vicinity of sugar-cane. *A. maidis* occurs also on various wild grasses, and appearances strongly suggestive of mosaic disease were found in *Panicum colonum* (wild millet), *P.*

sanguinale (summer grass), *Setaria aurea* (rat-tailed grass), and native *Sorghum*; these and other grasses should be eliminated so far as possible from the neighbourhood of the cane fields.

BURNS (A. N.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxv, pt. 4, pp. 321-322. Brisbane, 1st April 1926.

A very satisfactory control of *Laphygma* (*Prodenia*) *exempta*, Wlk., was obtained by spraying the sugar-cane for several rows in front of the advancing larvae with lead arsenate [*R.A.E.*, A, xiv, 331]. Inconclusive experiments with calcium cyanide (flake), benzine, a saturated solution of naphthalene in benzine, and two proprietary insecticides, for the control of larvae of *Lepidoderma albohirtum*, Waterh., attacking the roots of sugar-cane, are described. Cane sets, the ends of which had been dipped in dehydrated tar as a protection against *L. albohirtum*, germinated satisfactorily, but after 34 days there was no sign of growth in sets that had been entirely immersed in the liquid, although they were still green; considerable numbers of larvae were found in the plots containing the treated sets.

MUNGOMERY (R. W.). [**Report of the Southern Assistant Entomologist for February.**]—*Queensland Agric. Jl.*, xxv, pt. 4, pp. 327-328. Brisbane, 1st April 1926.

In some districts of Southern Queensland the most serious pests of sugar-cane are *Pseudoholophylla furfuracea*, Burm., *Lepidiota frenchi*, Blackb., and *L. grata*, Blackb.; all three species probably have a similar life-cycle, extending over two years. *P. furfuracea* occurs chiefly in volcanic soil, and *L. frenchi* in poorer forest soil, whilst *L. grata* occurs in association with either of the other beetles. A mole-cricket, *Gryllotalpa* sp., is usually only a minor pest, but occasionally does serious damage, particularly in damp ground; as a remedy deep ploughing in the spring previous to planting may be employed, or the soil may be treated with paradichlorobenzene or crude naphthalene when the cane is planted.

The Chrysomelid, *Rhyparida morosa*, Jac., is widely distributed in Queensland on grasses and sugar-cane; the larvae feed in the heart of the cane at about ground level, sometimes making numerous galleries and sometimes penetrating towards the root, and they may damage young plant or ratoon cane severely or even kill it. The adult beetles feed on the leaves. In order to avoid injury by *R. morosa* cane should, where possible, be planted from January to March, so that it is well established by the time that the larvae are active; wild *Sorghum* and other grasses should be kept down in and near the cane fields.

JARVIS (H.). **Fruit Fly in the Stanthorpe District.**—*Queensland Agric. Jl.*, xxv, pt. 4, pp. 367-370. Brisbane, 1st April 1926.

Very little damage was caused by *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) (Queensland fruit-fly) during November and December. In January four adults emerged in a cage in which several thousand larvae had been placed in the autumn, thus proving that it is possible for this fruit-fly to pass the winter as a pupa in the Granite Belt. Although it is unlikely that this factor is of great importance with regard to the annual infestation, even after a less rigorous winter than that of 1925, it emphasises the necessity for removing fallen fruit from orchards. The author still considers that the migration of fruit-flies from outside areas is mainly responsible for infestation in the Stanthorpe District [*R.A.E.*, A, xiii, 522]. The destruction of fruit-fly larvae in fruit is best accomplished by burying the fruit or submerging it in water ; for this purpose a pit or disused well is particularly suitable ; the fermentation of the fruit in water kills the larvae in three or four days. The practice of boiling infested fruit and disposing of it in heaps in the orchards should be avoided, as the aroma from the fruit is likely to attract fruit-flies into the orchard. Tests with pollard bait [*R.A.E.*, A, xii, 411] to attract *D. ferrugineus* were entirely unsuccessful over a period of several weeks. In breeding experiments with *D. ferrugineus* mature eggs were found in the ovaries of females 21 days after emergence, but in other cases no eggs were found after 28 days ; mating was not observed, and the flies could not be induced to oviposit in captivity.

D. ferrugineus var. *solani* (solanum fruit-fly) appeared in large numbers and earlier than *D. ferrugineus*. The only known food plant is wild tobacco (*Solanum auriculatum*), but the male flies are trapped freely in orchards with metheuginol. An apparently new species of fruit-fly has been bred from cultivated bananas and *Musa banksi* in North Queensland, and another fruit-fly, *Dacus ferrugineus* var. *jarvisi*, one of the native food-plants of which is the cockatoo apple (*Careya australis*), has been bred from pears and quinces.

SUBRAMANYAM (T. V.). *Coptosoma ostensum*, **Dist. and its Enemy** *Synia melanaria*, **Muls.**—*Jl. Bombay Nat. Hist. Soc.*, xxx, no. 4, pp. 924–925, 1 pl. Bombay, 15th December 1925.

Notes are given on the life-history and stages of *Coptosoma ostensum*, Dist., a Pentatomid that feeds on *Butea frondosa* in Madras, and of the Coccinellid, *Synia melanaria*, Muls., the larvae of which are predacious on it. The author believes that this it the first record of a Coccinellid predacious on a Pentatomid.

Notification no. 932 (Agri.).—*Govt. India Dept. Educ., Health & Lands*, 1 p. typescript. Simla, 19th May 1926.

Notification no. 1493 [*R.A.E.*, A, xiv, 88] is amended to allow of the restricted importation of cotton through Bombay at any time of the year and to modify directions for discharge from vessels of American cotton.

PILLAI (N. K.). **Entomology.**—*Rept. Dept. Agric. & Fisheries, Travancore, 1924–25*, p. 3. Trivandrum, 1926.

Nephantis serinopa (coconut leaf-roller) is recorded as doing serious damage in several parts of Travancore. The only method of control is to cut off and burn the affected leaves, and to spray the remaining ones with an insecticide, such as lead arsenate. The chief rice pests of the year were the rice bug [*Leptocorisa varicornis*], the rice swarming caterpillar [*Spodoptera mauritia*], for which the remedies have been noticed [*R.A.E.*, A, xi, 329], and the rice leaf-roller [*Cnaphalocrocis medinalis*].

BRITTAIN (W. H.). **Calcium Cyanide and its Utilization in the Control of Mound-building Termites or White Ants.**—*Bengal Agric. Jl.*, v (1925), no. 3-4, pp. 82-87. Dacca [1926].

The manufacture of calcium cyanide and its value in controlling insects and other animal pests are briefly described. Mound-building termites cause considerable damage to golf greens and similar places, and in jute warehouses in the neighbourhood of Dacca. P. C. Sen destroyed a number of colonies by placing calcium cyanide in some of the main tunnels and closing them up again. The author, using Cyanogas calcium cyanide "A" dust [*R.A.E.*, A, xiv, 74], forced the dust into some of the main tunnels by means of a foot-pump ; after removing a dome of the nest the pump was inserted into a tunnel and surrounded with mud to prevent the backward discharge of the dust, and wherever dust was seen to come out of openings in the nest these were stopped with mud ; dust was then pumped into other tunnels, the number depending on the size of the nest. As the queen is usually near the centre of a mound, particular attention was paid to that part.

Twenty-two termite colonies were treated, eleven in the open and eleven in warehouses ; the size of the nests varied from those covering an area of 4 by 3 feet to those extending over an area of 18 by 12 feet ; the amount of calcium cyanide used for each nest varied from a few ounces to 4 lb. Thirteen nests were dug up after treatment, and eleven queens were found dead and two, in places particularly difficult of access, alive, while two were not found. No sign of activity was observed in the seven colonies that were not dug up. Should one fumigation fail to exterminate a colony of termites, it would be easy to repeat the treatment.

ULTÉE (A. J.). **Verslag over de werkzaamheden van het Proefstation Malang in het jaar 1925.** [Report of the Malang Experiment Station for 1925.]—*Meded. Proefst. Malang*, no. 57, 52 pp. Soerabaya, 1926.

Borers were the most important pests of green manure plants during the year. *Xyleborus coffeae* occurred on the stems of *Crotalaria anagyroides* and also in *Tephrosia* and lamtoro [*Leucaena glauca*]. *Tephrosia* pods were attacked by *Araecerus*. *Stephanoderes* spp., including *S. hampei*, were found in the pods of *Centrosema plumieri*.

The Nematode, *Tylenchus coffeae*, was an important pest of *Coffea robusta*. The coffee-berry borer, *S. hampei*, did little harm except in a few cases, the average infestation of harvested berries being less than 10 per cent. Considerable infestation occurred in those estates that had had a heavy crop in the preceding year, and had on that account less opportunity for thorough application of the usual measures. Where the crop was not so abundant, the high prices obtained for coffee resulted in a very careful harvesting, with a consequent marked reduction in infestation in 1925. The parasite imported from Uganda [*Prorops nasuta*] is rapidly increasing and is being distributed artificially, though nothing as yet can be said as to its effect on this beetle. The mealybugs, *Pseudococcus citri* and *P. virgatus*, increased as a result of the prolonged drought lasting 5-6 months. The removal from the bushes of any growth that obstructs the direct washing by rain of the berry clusters is advised. Experiments with various insecticides were unsuccessful.

FULMEK (L.). **De groene tabaks-capside op boeboean** (*Polanisia viscosa*). [The Green Tobacco Capsid on *P. viscosa*.]—*Deli Proefst.*, Vlugschr. 36, 2 pp., 1 fig. Medan, April 1926.

The alternative food-plants of the green tobacco Capsid found in Sumatra, *Dicyphus nocivus*, Fulmek [*R.A.E.*, A, xiv, 327] have not yet been ascertained, but *Polanisia viscosa* has been discovered to be one of them. This weed is one of the Capparidaceae.

KURISAKI (M.). **On the Scientific Name and the Biology of the Japanese Vinegar Fly.** [*In Japanese.*]—*Bul. Sc. Fakultato Terkultura, Kijusu Imp. Univ.*, i, no. 5, pp. 274-284. Fukuoka, Japan, December 1925. (With a Summary in English.)

The correct name for the Japanese vinegar fly hitherto known as *Drosophila obscura*, Fall., is *D. melanogaster*, Mg. In Fukuoka the adults that have hibernated emerge at the end of March. They react negatively to light in a large room or in the open, but positively in test tubes or closed glass vessels. Mating may occur at any time of day. A single female lays about 200 eggs, and the egg stage lasts 32 hours in summer and 46 hours in winter. The larvae pupate in about 10 days, the pupal period lasting 72 hours on an average. The longevity of the adult depends on the sex and on environmental conditions, but is at least 40 days. As food, saké cake was preferred to a bean paste or a mixture of rice-bran and salt.

SASAKI (C.). **Notes on** *Tachina rustica*, **a Fly parasitic on the Silkworm.**—*Annot. Zool. Jap.*, xi, no. 1, pp. 71-74. Tokyo, March 1926.

Tachina rustica is abundant in Korea and causes great damage in the breeding-houses of the silkworm [*Bombyx mori*]. In Japan proper, however, it never enters houses, though it frequents mulberry fields from May to November, laying eggs in the wild silkworm, *Theophila mandarina*. The flies vary in size even in the same sex, though the females are generally a little larger then the males. Six or seven generations occur between spring and autumn, a single generation occupying 18-21 days in summer. The eggs are laid on the body of the silkworm, and the larvae penetrate into it and finally kill it a little before or after its pupation. A detailed account is given of the method by which the larva penetrates the body of the host.

ISHIDA (M.) & MORITSUGU (K.). **Injury by** *Scirpophaga auriflua* **Zell. (Pyralidae) to the Sugar-cane and its Control.** [*In Japanese.*]—*Dept. Agric. Res. Inst. Formosa*, Bull. 30, pp. 1-15, 2 pls. Taihoku, March 1926.

The larvae of *Scirpophaga auriflua*, Zell., bore into the stalks of the larger species of graminaceous plants and have infested up to 12 per cent. of the sugar-cane in the Tainan prefecture in recent years. Collection of the eggs, larvae and infested canes is recommended.

Ōho (S.). **Studies on *Alissonotum impressicolle*, Arrow (Scarabaeidae) injurious to the Sugar-cane.** [*In Japanese.*]—*Dept. Agric. Res. Inst. Formosa*, Rept. 18, pp. 1–52, 8 pls. Taihoku, March 1926.

Alissonotum impressicolle, Arrow, is the most important of the three species of this genus known to be injurious to sugar-cane in Formosa, and causes great damage to this crop in the south of the Island. There is one generation a year. The adults begin to emerge in March, but are more abundant from the middle of April to the middle of May. They are subterranean in habit, and bore into the underground parts of the plants. They appear on the surface after heavy rains; they are attracted to light at night, but exposure to strong sunshine for an hour kills them. Oviposition begins at the end of August, though most of the eggs are laid from the end of September to the end of October. They are laid singly in the soil and hatch in about 2 weeks. The larvae feed at first on decayed vegetable matter in the soil, and later on the subterranean parts of the cane. Pupation takes place about 156 days after hatching, and this stage lasts about 19 days on the average. Rice and *Cyperus* are also attacked by this beetle. Experimentally certain races of sugar-cane appear to be less attractive to it.

Silvestri (F.). **Descrizione di un novo genere di Coccidae (Hemiptera) mirmecofilo della Cina.** [Description of a New Myrmecophilous Genus of Coccidae from China.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric. Portici*, xviii, pp. 271–275, 2 figs., 1 ref. Portici,, 19th May 1926.

Eumyrmococcus smithi, gen. et sp. n., is described from individuals in a nest of *Acropyga sauteri*, For., at Macao.

Wilkinson (D. S.). **Entomological Notes.**—*Cyprus Agric. Jl.*, xxi, pt. 2, pp. 47–48. Nicosia, April 1926.

The general absence of *Aphis rumicis*, L. (black bean aphis), as compared with serious infestations of the previous year, was possibly due in part to heavy spring rains; it was also severely parasitised by *Trioxys centaureae*, Hal., *Ephedrus validus*, Hal., and *Aphidius cirsii*, Hal., while pupae of the Coccinellid, *Coccinella septempunctata*, L., occurred in large numbers in practically every bean field.

Investigations are being made with a view to controlling *Earias insulana*, Boisd., and *Platyedra gossypiella*, Saund., by planting early producing varieties of cotton. So far the varieties tested, such as Triumph, showed as much as one-third of the bolls to be attacked or otherwise in a diseased condition as a result of insect attack.

During 1925-26 about 3,000 orange trees were fumigated by the tent system for the control of *Chrysomphalus* (*Aonidiella*) *aurantii*, Mask. (red scale) in order to demonstrate the excellence of this method; indications are that the process will be largely followed in the coming season.

The regulations with regard to *Eurytoma amygdali*, End., and *Cydia* (*Carpocapsa*) *pomonella*, L. [*R.A.E.*, A, xiv, 199] are being strictly enforced. Attempts are being made to introduce *Microbracon gelechiae*, Ashm. (*Habrobracon johannseni*, Vier.) from America for the control of *Phthorimaea operculella*, Zell. (*Lita solanella*, Boisd.).

WILKINSON (D. S.). **Further Entomological Legislation in Cyprus.**—*Cyprus Agric. Jl.*, xxi, pt. 2, p. 51. Nicosia, April 1926.

This is a summary of the Order with regard to the importation of apple and pear trees into Cyprus dated 22nd February 1926, bringing the previous summary [*R.A.E.*, A, xiv, 198] up to date. No part of any tree of the genera *Pyrus*, *Sorbus*, *Ulmus*, and *Crataegus* may be imported, except through a given port and unless it is immediately disinfected on arrival. The Order does not affect bottled or tinned fruit, or seeds.

RENNIE (G.). **A Mermithid Parasite of** *Tipula paludosa*, **Meigen.**—*Proc. R. Phys. Soc. Edinburgh*, xxi, no. 1, pp. 1–3, 2 figs., 1 ref. Edinburgh, November 1925. [Recd. May 1926.]

Among large numbers of larvae of *Tipula paludosa*, Meig., a small proportion was found to contain an immature threadworm, *Agamomermis tipulae*, sp. n., coiled up in a sheath in the haemocoele. Larvae infested with these parasites die before reaching the pupal stage.

MORISON (G. D.). **The Khapra Beetle** (*Trogoderma granarium*, **Everts).** *Proc. R. Phys. Soc. Edinburgh*, xxi, no. 1, pp. 10–13, 6 figs., 5 refs. Edinburgh, November 1925. [Recd. May 1926.]

The chief damage done by *Trogoderma granarium*, Everts, in England is to malt and barley in malt houses where the temperature is sufficiently high for the multiplication of the beetles. Damage is also done in granaries and to various food-stuffs. The insect requires a temperature of about 80° F. for rapid multiplication.

The eggs are laid amongst the grain and take 5–9 days to hatch in a humid atmosphere at 31° C. [87–8° F.]. In captivity each female lays about 50 eggs. Under optimum conditions male larvae moult four times, female larvae five times, and the life-cycle is completed in about 50 days, but the number of moults may be doubled and the life cycle prolonged over a period of 200 days under adverse conditions of temperature and humidity. The pupa lies in the last larval skin. The larvae reduce grain to a powdery mass. Moreover, their barbed hairs, which are left in the grain in large quantities in a bad infestation, are a serious danger to man, if swallowed in numbers.

MORISON (G. D.). **Notes on the Broad-horned Flour Beetle** (*Gnathocerus* (*Echocerus*) *cornutus*, **Fabr.**).—*Proc. R. Phys. Soc. Edinburgh*, xxi, no. 1, pp. 14–18, 7 refs. Edinburgh, November 1925. [Recd. May 1926.]

Under suitable conditions of time, temperature and humidity, *Gnathocerus cornutus*, F., may become a serious pest to flour and meal. Grain and other dry food-stuffs are also attacked, but usually to no great extent. Most of the damage is done by the larvae. The optimum constant temperature for breeding is about 70° F., below 50° F. and above 80° F. being injurious. The adult females live a year, but the egg-laying period does not seem to last longer than the first eight months, and the full number of eggs appears to be about 100, laid singly at varying intervals of time. The incubation period lasts 7 days. The larvae moult 6 times, at intervals of about a month. They are very active, especially when about to pupate. The pupal period lasts 14–30 days according to temperature and humidity. The pupa is often found in the pupal cases of *Ephestia kühniella*, Z. There are only two generations a year under normal conditions.

The most serious enemies of *G. cornutus* are its own larvae, which eat the eggs and kill the fresh pupae emerging from the last larval skin, when they are eaten by both larvae and adults. Mites of the genera *Pediculoides* and *Glyciphagus* attack the eggs, and *Sclerodermus immigrans*, Bridwell, has been bred from *G. cornutus* in Hawaii.

While this beetle can mature on an entirely farinaceous diet, it prefers animal matter, and it can therefore be considered a beneficial insect when it occurs with *E. kühniella* and, presumably, all other insect pests that lay their eggs in flour.

AULLÓ (M.). **Organización de las campañas de extinción contra plagas de** *Lymantria dispar* **L.** [The Organisation of Eradicative Campaigns against *Porthetria dispar*.]—*Rev. Fitopatología*, ii–iii (1924–1925), pp. 5–12, 10 pls. Madrid, 1926.

Much of this information is given in papers already noticed [*R.A.E.*, A, xi, 577 ; xii, 145]. In 1921 a service for the study and eradication of forest pests was established in Spain. One of the Regional Entomological Stations was placed at Villanueva de Cordoba in an area of oak forests (*Quercus ilex*) covering about 150,000 acres. An outbreak of *Porthetria* (*Lymantria*) *dispar*, L., there resulted in a campaign on a larger scale than any previously attempted in Europe against this moth, the infestation of which covered about 1,000 acres in 1921 and extended over the entire area in 1924. Chemical measures consisted, in winter, in painting the egg-masses with a mixture of 4 parts coal-tar and 1 part petroleum. Where such applications were difficult, the newly hatched caterpillars were sprayed with petroleum or petrol. Later in spring spraying was done with sodium arsenate (usually 2–3 per mille) and lead arsenate. Besides directly poisoning the insects, poison sprays seem to hasten pupation, and weak adults are produced that have few offspring.

With regard to biological control it was found that in this region natural enemies were scarce, and that the most effective of them, the egg-parasites, were absent. About 1½ million *Anastatus disparis*, Ruschka, were introduced from the central provinces of Spain. This Eupelmid has become established and is spreading from the artificial foci. The eggs parasitised by it are separated from the others by means of an apparatus and methods identical with those used by the U.S. Bureau of Entomology [*R.A.E.*, A, v, 215].

Schedius kuvanae, How., sent by the U.S. Bureau of Entomology, is being acclimatised. *Apanteles vitripennis*, Hal., *A. melanoscelus*, Ratz., *Chalcis intermedia*, Nees and *Tricholyga grandis*, Zett., occur in the region involved, but in 1924 only 5 per cent. of the insects were parasitised by them. Predacious enemies are the Carabids, *Calosoma sycophanta*, L., *Steropus globosus*, F., and *Carabus gougeleti*, Reiche. The last-named is parastised by Tachinids.

DÍAZ (B.). **Trabajos realizados en la Estación entomológica regional de Mérida.** [Work done at the District Entomological Station of Mérida.]—*Rev. Fitopatología*, ii–iii (1924–1925), pp. 13–31. Madrid, 1926.

Part of this information has already been noticed [*R.A.E.*, A, xii, 146]. The observations were made from March to May 1923 in a district of Badajoz, where nearly all the oak forests are infested by *Tortrix viridana*, L. Birds are of great value against this moth and should be protected. Its parasites are rare and require further study. Direct measures are inapplicable on a large scale on the ground of cost, but may be resorted to in limited areas. During their first fortnight of life the larvae are in the unopened buds and are well protected against sprays, but it is suggested that a suitable poison injected into the tree might kill them without injury to the plant. Contact and stomach insecticides might be employed against older larvae as well as collection, and light-traps might be used for the adults.

Two Curculionids, *Polydrosus pilosulus*, Chev., and *P. nanus*, Db., were common on oak branches, and a borer, *Cerambyx* sp., attacked the trunks. *Pterochlorus* (*Lachnus*) *longipes*, Duf., was abundant on some oaks. The Dipteron most commonly found on oaks was *Dryomyia* (*Cecidomyia*) *lichtensteini*, Lw., forming leaf-galls from which the adults emerged early in April.

Mercet (R. G.). **Los parásitos del "poll-roig."** [The Parasites of *Chrysomphalus dictyospermi*.]—*Rev. Fitopatología*, ii-iii (1924–1925), pp. 32–39, 2 refs. Madrid, 1926.

These notes on the parasites of the red-scale, *Chrysomphalus dictyospermi*, Morg., are based on material received in Spain from Mentone, France, and Chiavari, Italy. The former was of local origin and the parasites are therefore European, whereas that from Chiavari had been obtained from Madeira.

Aspidiotiphagus lounsburyi, Berl. & Paoli, of which releases had been made at Mentone, was not found in the material from there, whereas *Aphelinus bovelli*, Malen., hitherto unrecorded from Europe, was the species predominantly represented. Other species were *Aphelinus chrysomphali*, Merc., *A. maculicornis*, Masi, and one specimen of *Prospaltella fasciata*, Malen.

The material from Chiavari contained *Aphelinus diaspidis*, How., and *A. maculicornis*. The three parasites of importance of this scale are *Aspidiotiphagus lounsburyi* (in Madeira) and *Aphelinus bovelli* and *A. chrysomphali* (in the South of France). Their utilisation requires careful study. A key to the Chalcidoidea parasitising *C. dictyospermi* is given.

Mercet (R. G.). **Calcidoideos parásitos de Curculiónidos y Escolítidos (1ª Parte).** [Chalcidoidea parasitic on Curculionidae and Scolytidae. (1st Part).]—*Rev. Fitopatología*, ii–iii (1924–1925), pp. 40–47, 2 figs. Madrid, 1926.

In this, the first part of this work, only the genus *Metacolus* is dealt with. *M. unifasciatus*, Thoms., was obtained in Spain from *Magdalis memnonia*, Gyll., and *Pissodes notatus*, F., both infesting *Pinus pinaster*, and from *Ips* (*Pityogenes*) *quadridens*, Hartig., infesting *Pinus sylvestris*. *M. aulloi*, sp. n., is described from females parasitising *I. quadridens* in Spain.

MERCET (R. G.). **Un nuevo parásito de la "lagarta peluda."** [A new Parasite of *Porthetria dispar.*]—*Rev. Fitopatología,* ii–iii (1924-1925), pp. 48–50. Madrid, 1926.

Eggs of *Porthetria* (*Lymantria*) *dispar* received in 1924 from the oak forests in Cordova were found to be parasitised by the Encyrtid, *Ooencyrtus masi,* Mercet, which has not hitherto been recorded from this host. It is not easily distinguishable from *O. kuvanae,* How., which is considered to be the most effective parasite of *P. dispar.*

MERCET (R. G.). **Parásitos de la procesionaria del pino.** [Parasites of the Pine Processionary Caterpillar.]—*Rev. Fitopatología,* ii–iii (1924–1925), pp. 51–55. Madrid, 1926.

The pine processionary caterpillar, *Cnethocampa* (*Thaumetopoea*) *pityocampa,* is a common pest in the central plateau of Spain. Its natural enemies include the Chalcids, *Ooencyrtus pityocampae,* Mercet, *Trichogramma semblidis,* Auriv., and *Tetrastichus* sp., parasitising the eggs, the first two being of more economic value. An Ichneumonid, *Anomalon latro,* Schr., parasitises the caterpillars, and two or three Tachinid flies of the genus *Exorista* seem to attack the pupae.

AULLÓ (M.). **Enfermedades de los pinos.—Desecación de las copas.** [Diseases of Pines. The Withering of the Branches and Foliage.] —*Rev. Fitopatología,* ii–iii (1924–1925), pp. 56–60. Madrid, 1926.

The withering of pines in Spain may be due to infection with *Peridermium pini* or *Lophodermium pinastri* either alone or associated with Scolytid beetles (*Ips, Pityogenes,* etc.), or infestation by the caterpillars of *Dioryctria splendidella,* Ratz., producing resinous exudations, or by weevils of the genera *Pissodes* and *Magdalis,* which produce no flow of resin and are to be found under the bark.

REBELLÓN (A.). **Insectos y vegetales que atacan al arbolado, observados en la provincia de Segovia (zona de Cuéllar).** [Insects and Plants that attack Trees, observed in the Province of Segovia (Zone of Cuéllar).]—*Rev. Fitopatología,* ii–iii (1924-1925), pp. 61–65. Madrid, 1926.

This is a list of insects and other pests of trees under their scientific names.

MARINA (G.). **Los curculiónidos de los pinos.** [Pine Curculionids.] —*Rev. Fitopatología,* ii–iii (1924–1925), pp. 66–70. Madrid, 1926.

The weevils infesting pines comprise *Brachyderes suturalis,* Graëlls, *B. incanus,* L., and *Scythropus glabratus,* Chevr., attacking the needles; *Pissodes* spp., *Hylobius* spp., *Magdalis rufa,* Germ., *M. memnonia,* Gyll., and *M. violacea,* L., attacking the branches, trunk and roots; and *Pissodes validirostris,* Gyll., infesting the cones. Trap-logs have hitherto been recommended only for *Hylobius abietis,* L., but experiments made by the Spanish Forest Service showed that 95 per cent. of the catches consisted of *Magdalis* and 5 per cent. of *Pissodes.*

Riesgo y Ordóñez (A.). **Causes de la desaparición de los olmos y trabajos de extinción contra la** *Galerucella luteola,* **Müll.** [The Causes of the Disappearance of Elms in Spain and Measures against *G. luteola.*]—*Rev. Fitopatología,* ii–iii (1924–1925), pp. 71–76. Madrid, 1926.

In a campaign at Granada against *Galerucella luteola,* Müll. (elm-leaf beetle), the trees were sprayed with sodium arsenate. At first anhydrous sodium arsenate was used at a strength of 2 per mille, but to decrease scorching of the foliage of neighbouring plants it was later used at 1¼ per mille and still gave excellent results, killing the larvae in 36–48 hours.

Friederichs (K.). **Ueber die Frage der chemischen Bekämpfung des Kaffeeschädlings** *Stephanoderes hampei.* [On the Question of the chemical Control of the Coffee Pest, *S. hampei.*]—*Centralbl. Bakt. Paras. Infekt.,* IIte Abt., lxvii, no. 1–7, pp. 36–40, 3 refs. Jena, 28th May 1926.

The information here given is substantially the same as that in a paper already noticed [*R.A.E.*, A, xii, 201].

Bauer (A.). **Einige Beiträge zur Lebensweise und Bekämpfung der Hopfenblattläuse.** [Some Contributions to the Life-history and Control of Hop Aphids.]—*Arb. Dtsch. Sektion Landeskulturrates Böhmen,* no. 34, 28 pp., 2 pls. Prague, 1925. (Abstract in *Centralbl. Bakt. Paras. Infekt.,* IIte Abt., lxvii, no. 1–7, pp. 139–140. Jena, 28th May 1926.)

During the past 25 years the hop aphis [*Phorodon humuli*] has done severe damage to hops in the Saaz district, Bohemia, outbreaks always occurring in years with a very dry, warm spring. The winged form appears on hops at the end of May or early in June and infests the young leaves. The first broods produce exclusively wingless viviparous females, the offspring of which reach maturity in about 3 weeks. Hops are only an intermediate food-plant, and in the autumn winged forms are produced that return to the as yet unknown primary food-plant (possibly *Prunus*).

This pest appears to increase with the extension of hop cultivation on wires. Tobacco extracts, solutions of quassia and a number of proprietary contact insecticides are recommended against it.

Tempel (W.). **Die Kirschblüten- oder Zwetschenmotte** (*Argyresthia ephippiella,* **F.**) **und ihre Bekämpfung.** [The Cherry Blossom and Plum Moth, *A. ephippiella,* and its Control.]—*Die kranke Pflanze,* iii, no. 5, pp. 85–87. Dresden, May 1926.

Of late years *Argyresthia ephippiella,* F., has done considerable injury to cherry trees throughout Saxony. The flight-period extends from the end of May to early August, the eggs being laid from the second half of July onwards. They are deposited in cracks in the bark and do not hatch until early in the following spring. The larvae penetrate the flower- and leaf-buds, either by entering between the bud-scales or by boring. In the spring of 1926 cherry trees that were dusted with an arsenical showed 8–10 per cent. of infested blossoms as compared with 50–75 per cent. on untreated trees. On trees sprayed with this poison 20–30 per cent. were attacked.

Bremer (H.). **Schädlingsbekämpfung mit flüssigen Arsenködern in Deutschland.** [Pest Control with liquid arsenical Baits in Germany.] —*Anz. Schädlingsk.*, ii, no. 5, pp. 56–58, 3 refs. Berlin, 15th May 1926.

Sweetened liquid arsenical baits have not hitherto been used in Germany. As the beet-fly, *Pegomyia hyoscyami*, Panz., is best combated in the adult stage, and as the adults need carbohydrates during the pre-oviposition period and prefer sugary substances, experiments were made with these as bait sprays. Molasses proved unsatisfactory but sugar was effective though more costly, a good bait being water with the addition of 0·4 per cent. of dry sodium arsenate and 5 per cent. of raw sugar. Glycerine seems an unnecessary ingredient. As a result of many tests 7 gals. of the solution was found sufficient for an acre, every fifth row of beet plants being sprayed. Examinations in August showed 16 eggs per plant in a sprayed field and 87 in an untreated one. On the ground beneath 10 plants 25 dead flies were found, the majority of which were beneath plants in sprayed rows, thus indicating the rapid action of the poison. The cost of treatment was small. No injury occurred to man or domestic animals, but other insects, such as the larvae of *Blitophaga opaca*, L. (beet beetle), were destroyed. The parasites of *P. hyoscyami* are not affected to any extent as they usually appear in the larval stage of the fly.

Sprengel (L.). **Grossbekämpfung des Heu- und Sauerwurmes in der Pfalz.** [Large-scale Measures against the Spring and Summer Generations of Vine-moths in the Palatinate.]—*Anz. Schädlingsk.*, ii, no. 5, pp. 59-60. Berlin, 15th May 1926.

For 1926 measures on a large scale have been planned against the vine-moths [*Clysia ambiguella* and *Polychrosis botrana*] in the Palatinate, having been made possible by a grant by the Bavarian Government of about £25,000 and price-concessions on the part of insecticide manufacturers.

Morstatt (H.). **Bibliographie der Pflanzenschutzliteratur. Das Jahr 1925.** [A Bibliography of Plant Protection Literature in 1925.]—*Biol. Reichsanst. Land- u. Forstwirtschaft*, iv + 228 pp. Berlin, P. Parey; J. Springer, 1926.

Previous issues of this annual bibliography have already been noticed [*R.A.E.*, A, xiii, 439, etc.].

Stechow (E.). **Die Noctuide** *Miana strigilis* **Cl., ein neuer Schädling an Knaulgras.** [The Noctuid, *M. strigilis*, a New Pest of Cocksfoot Grass.]— *Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 6, pp. 46–47. Berlin, June 1926.

In May 1924 a field of cocksfoot, *Dactylis glomerata*, was severely injured by the caterpillars of the Noctuid, *Miana strigilis*, previously unknown as a pest of this grass in Germany. The infestation did not recur in 1925. Other pests recorded from cocksfoot grass include another Noctuid, *Apamea testacea*, an Aphid, *Macrosiphum granarium* (*Siphonophora cerealis*), a Nematode, *Tylenchus tritici*, and a mite, *Tetranychus telarius*.

KLEINE (R.). **Die Abhängigkeit der Getreidehalmfliege** (*Chlorops taeniopus*) **von der Temperatur.** [The Dependance of *C. taeniopus* on Temperature.]—*Zeitschr. wiss. Insektenbiol.*, xxi, no. 4–5, pp. 91-98. Berlin, 31st May 1926.

Chlorops taeniopus does not occur in normal years on the Baltic coast near Stettin. From 1917 it was absent until 1925, when a serious infestation of summer crops occurred. Summer oats were not attacked, but barley and summer wheat were affected. These outbreaks are attributed to the fact that the air-temperatures in 1917 and 1925 were high in May and June, during which months the infestation takes place, and that these years were well beneath the average as regards the amount of rain.

KOPP (A.). **Das Leben der Weizenhalmfliege,** *Chlorops taeniopus* **Meig.** [The Life of the Wheat Stem Fly.]—*Fortschritte Landw.*, i, no. 11, pp. 337–339, 3 figs. Vienna, 1st June 1926.

The wheat stem fly, *Chlorops taeniopus*, Mg., is stated to have two generations a year, but the author in 1925 investigated the possibility of a third generation in Moravia. Adults occurred from about 10th May to the end of the month. Oviposition seldom occurred on oats and barley. On *Agropyrum repens* only a few eggs were found, grasses being too forward in growth by 20th May to suit the larvae. The latter appeared at the end of May and continued up to the end of June. Pupae were found during the first three weeks of July. No spring adults were seen after 10th June. The male dies soon after mating, and the female after depositing from 20 to 25 eggs. Adults of the first generation occurred from 20th July to 10th August approximately. In the lowlands they had emerged by the end of July, and even in the hills only empty pupal cases were seen on the 15th August. There is therefore no reason to fear that living pupae may remain in threshed straw. This first generation also oviposits on flowering Umbelliferae, the eggs being found on wild carrot and sedge, as well as on *A. repens*, etc. The larvae of the second generation occurred throughout August, and pupae during the first three weeks in September. The adults appeared from about 20th September to 10th October. The resultant larvae (third generation) occurred from early October up to about 20th April, when they pupated.

LOOS (K.). *Dendroctonus micans* **L. an Kiefer** (*Pinus silvestris*). [*D. micans* on *P. sylvestris.*]—*Sudetendeutsche Forst- u. Jagdzeitung*, xxv, p. 53, 1925. (Abstract in *Neuheiten Gebiete Pflanzenschutzes*, 1926, no. 2, pp. 49–50. Vienna, 1926.)

Dendroctonus micans, L., is recorded as breeding in *Pinus sylvestris*, in Bohemia.

FARSKY (O.). **Výsledky pokusného hubení puklice švestkové** (*Lecanium corni* **Bché.**).—*Ovocnické rozhledy*, xvi, p. 1-10, 1 map. Prague, 1925. (Abstract in *Neuheiten Gebiete Pflanzenschutzes*, 1926, no. 2, p. 53. Vienna, 1926.)

The plum scale, *Lecanium corni*, Bch., is very common in Moravia and Silesia, owing to the widespread distribution of *Robinia* spp., its chief food-plants, and to neglect in the orchards. Thorough pruning, the scraping off of all old bark after rain, the manuring and cultivation of the soil beneath the tree, and the uncovering of the root-collar when spraying, are the measures advised. Spraying is necessary after the leaves have fallen and again before the buds open. If the infestation is very severe another application is needed in March. Suitable sprays are 4–6 per cent. carbolineum (10 per cent. in severe cases) or 10–20 per cent. kainit with the addition of 2 per cent. methylated spirit and an adhesive. After the scales have been got rid of, the trees are best sprayed with 5 per cent. carbolineum in the following years. All débris, prunings and fallen leaves should be burned.

OREST (M.). **Beiträge zur Generationsfrage einiger Borkenkäfer.** [The Question of the Number of Generations of certain Bark-beetles.]—*Zool. Anz.*, lxvii, no. 3–4, pp. 81–87, 2 refs. Leipzig, 20th May 1926.

Detailed observations and experiments, both in the field in Bukovina and in the laboratory, show that the aggregate amount of heat required to ensure the development of two full generations of *Scolytus scolytus*, F., *S. multistriatus*, Marsh., *S. pygmaeus*, F., and *S. ulmi*, Redt., in a year, could only be obtained in the laboratory, and that in the field the second generation hibernates in the larval stage.

In the case of *Hylastes* (*Hylurgops*) *palliatus*, Gyll., two generations a year is the rule, and the second may hibernate as larvae or pupae. Similarly *Pityogenes bidentatus*, Hrbst., and *Pithyophthorus glabratus*, Eichh., generally have two generations a year.

SCHENK (P. J.). **Lastige insecten voor den tuinbaas.** [Insects troublesome to the Gardener.]—*Floralia*, xlvii, no. 22, pp. 347–348, 4 figs. Assen, 4th June 1926.

This article gives a brief account of the leaf-eating beetles, *Crioceris lilii*, *Agelastica alni*, *Galerucella viburni* and *Gastroidea viridula*, infesting lilies, alders, guelder rose [*Viburnum opulus*] and sorrel respectively. *G. viridula* also occurs on rhubarb and radish. Sorrel may be sprayed with a 2 per cent. solution of barium chloride and alders with 1 per mille Paris green and 1 per cent. milk of lime; lilies and guelder rose are best sprayed with 5 per mille lead arsenate.

FEYTAUD (J.). **Contribution à l'étude des Symphyles.**—*Rev. Zool. agric. & appl.*, xxv, nos. 1 & 2, pp. 1-11 & 25–32, 3 figs., 14 refs. Bordeaux, February 1926.

Maize in Gironde was badly damaged in 1924 by the Myriapod, *Scutigerella immaculata*, Newp., and its anatomy and development is discussed. Most of the information regarding the feeding habits and methods of control are taken from other sources [*R.A.E.*, A, xii, 578, etc.]. These Myriapods attack the germinating grain and afterwards the roots; haricot beans, wheat, potatoes, pumpkins, beetroots, carrots, asparagus and clover are also attacked, a characteristic feature being the patchy nature of the vegetation produced. Well cultivated and manured fields seem to be the most severely infested and apparently the centipedes can breed in manure and leaf-mould, in the absence of growing vegetation. As this species is very widespread in France, it is probably responsible for much damage that has not yet been attributed to it.

A solid fumigant that can be spread on the soil surface will probably be the most successful. The author is experimenting with paradichlorobenzene and other fumigants, but the results are not yet sufficiently conclusive for their recommendation on a large scale.

DIEUZEIDE (R.). **Le Papillon gris de la farine** (*Ephestia kuehniella*, **Zeller**).—*Rev. Zool. agric. & appl.*, xxv, no. 2, pp. 17–25, 1 fig., 25 refs. Bordeaux, February 1926.

Flour from Oran (Algeria) was found to be very badly infested with *Ephestia kühniella*, Zell., minor injury being caused by *Tribolium confusum*, Duv., *Gnathocerus cornutus*, F., and *Tenebroides* (*Trogosita*) *mauritanicus*, L., the importance of which as a pest has not been determined. *E. kühniella* does not seem to occur in any of the big flour mills of Algiers. Potatoes, cocoa and biscuits in storage are also seriously attacked by this moth, but in flour mills it is particularly troublesome owing to its presence clogging the pipes and machinery. The remedies suggested are the use of clean sacks and machinery, the buildings being constructed so as to be very light and to allow of no shelter for the larvae in the walls or ceilings. When mills have become infested, raising the temperature to 118 to 125° F. by means of steam, or reducing it to 20 or 30° F. (where the climate facilitates this, as in Canada) has given very good results. A list is given of the natural enemies recorded by other workers. At Oran, the Ichneumonid, *Nemeritis canescens*, Grav., was reared from this pest [*R.A.E.*, A, viii, 544].

[**Reports on the Work of the Entomological Stations in France for the Year 1925.**]—*Ann. Epiphyties*, xi, no. 6, pp. 471–485. Paris, 1925. [Recd. June 1926.]

This includes a number of reports from the directors of the entomological stations at Paris, Rouen, Mentone, Chalette-Montargis, Bordeaux, and Saint-Genis-Laval. At the Paris Station, larvae of the Capsid, *Calocoris biclavatus*, have been found to attack very young pears, resulting in deformations that may lead to a loss of up to 70 per cent. of the crop. The rearing and distribution of *Aphelinus mali* against the woolly aphis [*Eriosoma lanigerum*] continues. In Mentone, the demand for *Novius cardinalis* against *Icerya purchasi* is still increasing. *Cryptolaemus montrouzieri* is maintaining itself in that region, though its development is much slower than that of *N. cardinalis*. A colony of 200 of another Coccinellid, *Hippodamia convergens*, has been introduced from the United States in readiness for use in the spring against Aphids, particularly those on beet.

In the course of studying olive pests, *Rhogas circumscriptus* has been found to be parasitic on *Prays oleellus*, and *Apanteles fulvipes*, *Eulophus longulus* and *Encyrtus mayri*, on the Gracilariid miner, *Oecophyllembius neglectus*. Another moth, *Tephroclystia pumilata*, is very injurious to olive flowers.

An investigation of Aphid injuries at Chalette-Montargis has shown that very important damage is caused by root-infesting species of *Forda*, *Tychea*, *Paracletus*, and *Anoecia*, which live on the roots of cultivated graminaceous plants. Young firs (*Abies*) in nurseries at Orleans have been killed by *Prociphilus bumeliae* attacking the roots. A species of *Trama* riddles many root vegetables in autumn and *Aphis subterranea* injures carrots ; the latter lives at the crown of the umbel, later splitting the cortex and descending the crevice to the end of the main root. *Myzus persicae* is abundant everywhere ; in spring and autumn on peach, in summer on potato, wild solanaceous and other plants, and in winter in vegetable gardens. *Aphis rumicis* and allied species are very prevalent and injurious to beet. The Tineid, *Sophronia humerella*, is very abundant on lavender plantations in the Drôme district. Arsenicals have proved useless against this pest, and cutting down the old plants in the winter is recommended, as there is only one generation a year and the young larvae hibernate under the bark.

SERGENT (Ed.) & ROUGEBIEF (H.). **De l'antagonisme entre les Drosophiles et les moisissures.**—*C. R. Acad. Sci. France*, clxxxii, no. 20, pp. 1238–1239. Paris, 1926.

From further experiments [*R.A.E.*, A, xii, 559 ; xiii, 297] carried out with *Drosophila* caged on vines, the conclusion is reached that the larvae feed on the moulds, and are thus beneficial, and the adults serve as agents in the dissemination of the yeasts.

BICHET (R.). **La lutte contre la Pyrale, la Cochylis et l'Eudémis en Bourgogne, en Champagne et dans la Loire-Inférieure.**—*Prog. agric. & vitic.*, lxxxv, no. 24, pp. 566–572. Montpellier, 13th June 1926.

Of the vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] only the latter occurs in Beaujolais ; in Côte-d'Or both are present, though the former appears to be dying out in Burgundy. In Champagne *C. ambiguella* is by far the more important and *P. botrana* has only two generations there, while in Côte-d'Or and the Rhône it has three generations, though the last is not a complete one. At Beaune, the larvae of *P. botrana* infested grapes up to the time of harvest, while the attacks of *C. ambiguella* had ceased before picking began. The vine Pyralid [*Sparganothis pilleriana*, Schiff.] seems to have disappeared from Beaujolais.

In the Loire-inférieure, experiments were made in the winter of 1925–26 with hot air apparatus, which worked well, but great heat had to be used to kill all the pupae, and it was not known at the time of writing how the vines would stand this treatment ; if successful, it will replace the old hot water treatment. Experiments are also being made with sulphuric acid on the stocks after removal of the bark, but the results are not yet known. In the spring and summer, a number of tests were made with various insecticides, including pyrethrum-soap, nicotine, soft soap, turpentine, paraffin, and certain proprietary substances. The results obtained with each are described, nicotine proving by far the most effective against either the first or second generation of moths or both, and whether used alone or with Bordeaux mixture. It was found that treatment against the first generation was almost useless, while against the second it was most effective ; treatment against both generations sometimes gave better and sometimes inferior results compared with that against the second generation only.

As arsenicals are only permitted for use against the first generation, they lose much of their value, but, judging from results obtained in the Rhône district, treatment against the first generation is indispensable although insufficient in itself. Tests have been begun with arsenical powders containing 10 and 15 per cent. of arsenic anhydride, that is, chemically pure calcium arsenate mixed with lime in the proportion of 1 to 3 or 1 to 4. These powders should be used when the florets have separated, that is about the end of May or beginning of June in the Rhône district, using about 8 to 12 lb. an acre. As these powders are not adhesive, they cannot be used as the principal measure against the larvae, but only as supplementary to one or two applications of Bordeaux mixture with lead or calcium arsenate. Their effect on the weight of the crop has yet to be determined.

Leuzinger (H.). **Observations sur les deux espèces de vers de la vigne** *Conchylis ambiguella* **(Cochylis) et** *Polychrosis botrana* **(Eudémis) et la lutte entreprise contre ces deux ennemis du vignoble dans le canton du Valais en 1925.**—*Bull. Soc. Murithienne*, xliii, pp. 53–93, 1 pl., 6 figs., 12 refs. Sion, 1926.

An account is given of the vine moths, *Clysia* (*Conchylis*) *ambiguella* and *Polychrosis botrana* as occurring in various parts of the Canton of Valais, where they do a great deal of damage. Lead arsenate, pyrethrum-soap and nicotine all gave good results when applied carefully and at the right time ; pyrethrum-soap has the disadvantage of not mixing with Bordeaux mixture. By treating the vines twice with 2 per cent. lead arsenate against the first generation 95 per cent. mortality was obtained. The results in Valais showed no ill effects from the use of this poison provided that reasonable precautions were observed, and it is thought to be only a matter of time before its general use will be allowed.

Faes (H.) & Tonduz (P.). **Rapport annuel—1925. Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. A. Division de physiologie et pathologie végétale.**—*Ann. agric. Suisse*, xxvii, no. 2, pp. 241–258, 6 figs. Berne, 1926.

Experiments in vineyards lightly infested with *Phylloxera* have shown that as much as one-third of an ounce of carbon bisulphide per vine-stock can be injected into the soil without danger after the harvest. Other vine pests of the year included *Clysia ambiguella* and *Polychrosis botrana*, which were very abundant after the very dry winter of 1924–25, and *Psyche graminella*, The sawfly, *Neurotoma* (*Lyda*) *nemoralis* and Aphids occurred on fruit trees, and larvae of *Hemerophila* (*Simaethis*) *pariana* were very numerous on apple foliage, causing russeting of the leaves.

Hering (M.). **Eine neue** *Phytomyzoptera-* (*Phytomyptera-*) **Art. (Dipt. Tachin.).**—*Konowia*, v, no. 1, pp. 21–24. Vienna, 10th June 1926.

A Tachinid, *Phytomyzoptera gracilariae*, sp.n., is described from the caterpillars of *Gracilaria roscipennella*, Hb., mining the leaves of walnut (*Juglans regia*) in Switzerland.

MENOZZI (C.). **Notizie sul maschio dell'*Icerya purchasi*, Mask.** [Notes on the Male of *I. purchasi*.]—*Redia*, xvi, pp. 105–110, 2 figs., 7 refs. Florence, 17th May 1926.

Males of *Icerya purchasi*, Mask., are of rare occurrence, but during 1925 numbers of them were observed in various parts of Liguria, and descriptions are given of the nymphs.

KLEINE (R.). **Studien über die Widerstandsfähigkeit verschiedener Hafersorten gegen die Fritfliege.** [Studies on the Resistance of various Varieties of Oats to the Frit Fly.]—*Fortschritte Landw.*, i, no. 12, pp. 373–380, 9 figs. Vienna, 15th June 1926.

The experiments already noticed [*R.A.E.*, A, xi, 341 ; xii, 293] have been continued with a large number of varieties of oats and are described in detail. They indicate that resistance to attack by *Oscinella* (*Oscinis*) *frit* is a constant character of certain varieties.

BAUNACKE (—). **Wieder die Runkelfliege !** [The Beet Fly again.]—*Die kranke Pflanze,* iii, no. 6, pp. 108–109. Dresden, June 1926.

Following the abundance of *Pegomyia hyoscyami* in 1925 in Germany the mild winter was favourable to the fly in spring, but the cold rains occurring after April are believed to have destroyed the majority of the spring generation while the growth of the plants was favoured, so that they rapidly reached a stage where attack is negligible in its effects. Spraying with a sweetened sodium arsenate bait during the flight-period has been found to be an effective measure for destroying the spring adults before they have oviposited [*R.A.E.*, A, xiv, 376] ; and it is here suggested that this bait is best applied in the form of a dust while the plants are wet with dew.

SCHEIDTER (F.). **Forstentomologische Beiträge. 8-13.** [Contributions to Forest Entomology. 8–13.]—*Zeitschr. Pflanzenkr.*, xxxvi, no. 7–8, pp. 193–226, 17 figs. Stuttgart, 1926.

Descriptions are given of the methods of oviposition in the following species of sawflies with gregarious larvae : *Diprion* (*Lophyrus*) *pini*, L., *D.* (*L.*) *similis*, Htg., *D.* (*L.*) *pallidus*, Kl., *D.* (*L.*) *socius*, Kl., *D.* (*L.*) *rufus*, Kl., and *D.* (*L.*) *dorsatus*, F. *D. pini* has two generations a year in the regions of the Rhine and Main and only one in the plateau of Upper Bavaria. *Acantholyda* (*Lyda*) *stellata*, Christ, is a recognised pest of pines in North Germany ; in Bavaria the first outbreak was noticed 3–4 years ago. Banding has been resorted to against this sawfly, but is useless, as the adults can fly to the crowns of the trees. In Bavaria mating and oviposition occur in May. The larvae prefer the needles of the preceding year. Examinations of the ovaries of *Trichiosoma lucorum*, L., showed an average of 200 eggs per female.

The development of the hairs of the caterpillar of *Notolophus* (*Orgyia*) *antiquus*, L., is described in detail with notes on the pupa.

The Chrysomelid beetles, *Melasoma populi*, L., and *M. tremulae*, F., have two generations a year in Bavaria, the first being produced by hibernated adults that attack poplar and willow on issuing from their winter-quarters. Over 1,000 eggs per female were laid in captivity.

In 1921 an infestation of willows in Bavaria by *Melasoma* (*Lina*) *vigintipunctata*, Scop., was brought to an end almost entirely by a Chalcid parasite, *Schizonotus sieboldi*, Ratz., a Tachinid fly being the most important of its other enemies.

ZACHER (F.). **Das Auftreten der wichtigsten Vorratsschädlinge in den letzten Jahren.** [The Occurrence in Germany in recent Years of the chief Pests of Stored Products.]—*Mitt. Ges. Vorratsschutz*, ii, nos. 3–4, pp. 30–32, 41–43, 4 figs. Berlin, May & July 1926.

The information here given on the occurrence of various pests of stored products in Germany has been noticed from several papers previously issued. As a result of the damp weather of 1924 mites were especially numerous, whereas in the dry weather of 1925 moths were predominant.

VOELKEL (H.). **Ueber den Messingkäfer** *Niptus hololeucus* **Fald.** [On *N. hololeucus*.]—*Mitt. Ges. Vorratsschutz*, ii, nos. 3–4, pp. 37–38, 46–48. Berlin, May & July 1926.

In Germany *Niptus hololeucus*, Fald., was first recorded between 1840 and 1850, having been, in all probability, introduced from South Russia. In 1837 this Ptinid was noticed for the first time in a brush factory in London. During the past year the beetle has been observed in various parts of Germany.

MICHAL (K.). **Die Ernährungsweise des Getreideschmalkäfers** *Silvanus surinamensis*. [The Manner of Nutrition of *S. surinamensis*.]—*Anz. Schädlingsk.*, ii, no. 6, pp. 67–70, 1 fig. Berlin, 15th June 1926.

The date of oviposition in *Silvanus surinamensis*, L., appears to occur at a certain period fixed by hereditary habit, but this grain beetle cannot establish itself in Czechoslovakia owing to its slight power of resistance to frost. The larvae require a rather high temperature and much atmospheric moisture. They cannot, unaided, injure healthy grain, but live on the débris and excreta left by *Calandra*. They are not predacious and cannot live on animal food. All the pupae obtained during or before December were females while those from January and February were exclusively males.

ANDRES (A.). **Angewandte Entomologie in Aegypten.** [Applied Entomology in Egypt.]—*Anz. Schädlingsk.*, ii, no. 6, pp. 73–74. Berlin, 15th June 1926.

This is a brief survey of the chief entomological problems in Egypt and of the entomological service there.

HUKKINEN (Y.). **Notizen über unsere Schädlinge und Nützlinge.** [Notes on our injurious and beneficial Insects.]—*Not. ent.*, vi, no. 2, pp. 48–51. Helsingfors, 1st June 1926.

The Lycaenid, *Cyaniris argiolus*, L., occurs throughout Finland, at least up to 65° N. latitude, and though a number of its food-plants have been recorded, it does not appear to have been previously observed on black currant (*Ribes nigrum*). Since 1918 the caterpillars have, however, been found on several occasions boring into unripe black currants,

Lycaena ? semiargus, Rott., attacks the flowers and seeds of red clover in Finland. The caterpillar lives in the flower-head, which it destroys. The leaves and stems do not seem to be attacked. Besides red clover (*Trifolium pratense*), *T. medium* is also attacked but apparently not *T. hybridum*. All attempts to breed this Lycaenid with a view to its definite identification have failed, one difficulty being the long larval stage. Larvae collected in July hibernated.

NORDMAN (A. F.). **Ueber die Biologie und Verbreitung von** *Zelleria ribesiella*, **de Joann.** [The Biology and Distribution in Finland of *Z. ribesiella*.]—*Not. ent.*, vi, no. 2, pp. 51–55, 4 figs., 4 refs. Helsingfors, 1st June 1926.

The caterpillar of *Zelleria ribesiella*, de Joann., mines the leaves of black currant and gooseberry in Finland. The adult hibernates and oviposits in May (and perhaps in early June) on the undersides of the leaves, 1 or 2 eggs being usually laid on each leaf. If several larvae occur on a leaf, the entire centre of the latter is eaten except for the larger nervures. Pupation takes place in a white cocoon. Among nearly 200 caterpillars, 64 were parasitised, 63 by *Apanteles* sp. and 1 by *Mesochorus* sp.

Kapok. A survey of its Production within the Empire, with Notes on its Cultivation and Uses.—*Bull. Imp. Inst.*, xxiv, no. 1, pp. 18–36, 9 refs. London, June 1926.

In Malaya and certain other countries termites are the most serious pests of kapok (*Eriodendron anfractuosum*), especially of young plants. Species of *Dysdercus* sometimes attack the pods, in various parts of the world, and in St. Vincent all kapok trees are compulsorily destroyed on account of their harbouring one of these cotton-stainers. In the Belgian Congo, kapok trees in the neighbourhood of cacao plantations are cut down, since they serve as food-plants for *Sahlbergella singularis*. Larvae of several species of moths do a certain amount of damage to kapok, and *Mudaria variabilis* sometimes destroys a large proportion of the crop in Java. The larvae feed on the undeveloped fibre and seeds of the green pods, and even if any fibre should mature, it is usually badly stained, whilst birds, in their search for the larvae, often complete the destruction of the pods. In Mauritius the attacks of *Batocera rubus* have caused the cultivation of kapok to be abandoned.

RITCHIE (A. H.). **Memorandum on Bulrush Millet** (*Pennisetum typhoideum*).—7 pp. typescript. Morogoro [Tanganyika], January 1926. [Recd. July 1926].

In the course of his report on this crop, the author states that although it has been said to be immune in India from insect attack during storage, four insects have been found to attack it in Tanganyika Territory. Of these *Tribolium* sp., *Calandra oryzae* and *Corcyra cephalonica* cannot be reckoned as primary pests, as they are only attracted to grain already injured by *Sitotroga cerealella* (Angoumois grain moth) and to grain stores kept in a dirty condition. *S. cerealella* is, however, a serious pest, the larvae eating out the germ and webbing together the grain. The native method of control is to sift out dust, broken grain, webbing, etc., by means of circular baskets and sun the grain.

Matsumura (S.). **On the three Species of *Dendrolimus* (Lepidoptera), which attack Spruce- and Fir-trees in Japan, with their Parasites and predacious Insects.**—*Ann. Mus. Zool. Acad. Sci. U.R.S.S.*, xxvi (1925), pt. 1–2, pp. 27–50, 7 figs. Leningrad, 1926.

Five species of *Dendrolimus* attack conifers in Japan. They are *D. superans*, Btlr., on *Tsuga sieboldi* ; *D. yezoensis*,Mats. ; *D. sibiricus*, Tshtvr., on various species of *Picea*, *Larix dahurica* and *Abies sachalinensis* and occasionally on *Pinus* spp. ; and *D. spectabilis*, Btlr., and *D. punctatus*, Btlr., which only occur on pines. Keys to the adults and larvae of the first three are given.

D. sibiricus is very injurious, but is attacked by many parasitic and predacious insects. In all 39 are here recorded, including the new species, *Hemiteles dendrolimi*, *Pezomachus dendrolimi*, *Exochilum dendrolimi*, *E. laricis*, *Habronyx matsukemushii*, *Mesochorus kuwayamae*, *Chorinaeus dendrolimi*, *Apanteles dendrolimi*, *Phanomerus dendrolimi*, *Pteromalus dendrolimi*,*P. matsukemushii*, *P. matsuyadorii*, *P. kuwayamae*, *Holcaerus* (?) *dendrolimi*, *Encyrtus pinicola*, *Trichogramma dendrolimi*, and *Echinomyia dendrolimi*.

Mesostenus matsukemushii from *D. yezoensis*, *Pimpla dendrolimi*, which was reared from *D. spectabilis* and may also attack the larvae of *D. sibiricus*, and the predacious Reduviid, *Nabis kurilensis*, are also described as new.

Duport (L.). **Rapport sur les travaux poursuivis à la station entomologique de Cho-Ganh en 1925.**—*Sta. ent. Phu-Ho*, Bull. périodique no. 24, 9 pp. Hanoi, 1925. [Recd. June 1926.]

The report for the early part of the year under review has already been noticed [*R.A.E.*, A, xiii, 520]. The numbers of the Braconid, *Doryctes strioliger*, Kieff., released for use against the coffee borer, [*Xylotrechus quadripes*, Chevr.] were considerably less in 1925 than in the previous year, but a large consignment was sent to another station. The rearing of the Bethylid, *Sclerodermus domesticus*, Kieff., was carried out on a much larger scale than previously. The parasites most frequently encountered on the plantations are the Braconids, *D. tristriatus*, Kieff., and *D. picticeps*, Kieff., but they seem to be of use only on young plantations or on coffee bushes of which the stems can easily be entered. The breeding of *Chlorophorus annularis*, Fairm. (bamboo borer) is being continued on an increasing scale for the sake of the parasites that can be reared from it.

Rice pests include the larvae of *Schoenobius incertellus*, Wlk., and of species of *Sesamia*, *Chilo* and *Cnaphalocrocis*. Several Rhynchota also occur, and may destroy as many as 30 to 40 per cent. of the grain on the young ears. Hand collection of these pests and destruction of infested stems are recommended ; more important still is the destruction of stubble after the harvest. Local outbreaks of the rice weevil [*Calandra oryzae*, L.] and of *Anobium* also occurred. *Sitotroga cerealella*, Ol., causes much injury to the seed, the only remedy being to dry it rapidly after the harvest, to keep it in tightly closed, cemented stores and removed from any material that encourages infestation.

Cotton is severely damaged by insects, the most dangerous being *Pyroderces* sp.; the collection and destruction of infested capsules, if promptly done, will largely reduce the injury by this pest and also by *Earias insulana*, Boisd. The capsules of native cotton are frequently attacked by *Oxycarenus laetus*, Kby.

Docters van Leeuwen-Reijnvaan (J.) & Docters van Leeuwen (W. M.). **The Zoocecidia of the Netherlands East Indies.**—601 pp., 1088 figs., 7 pls., 17 pp. refs. Buitenzorg, Botanic Gardens, 1926.

This is a monograph on the Nematodes, mites and insects that produce galls on plants in the Dutch East Indies. Comparatively few occur on cultivated plants, and those that do are seldom important pests. Among the exceptions are a midge, *Pachydiplosis oryzae*, Wood-Mason, infesting rice, particularly in nurseries; *Agromyza* sp. often causing much damage to *Phaseolus radiatus*; *Phthorimaea* (*Gelechia*) *heliopa*, Lw., on tobacco; a Psyllid on *Eugenia malaccensis*; and a Coccid on *Hibiscus* spp., which sometimes renders impossible the cultivation of the finer varieties of these plants.

Bernard (C.). **Verslag van het Algemeen Proefstation voor Thee over het jaar 1925.** [Report of the General Tea Experiment Station for 1925.]—*Meded. Proefst. Thee*, no. 95, pp. 3–26. [Buitenzorg] 1926.

In spite of the abnormally dry weather of 1925, *Helopeltis* was generally of slight importance, partly owing to the extension of the practice of planting green manure and shade trees, which ensures a vigorous growth of the tea. *Eriophyes* (*Phytoptus*) *theae* (pink mite) was troublesome in various districts, and *E. carinatus* (purple mite), not hitherto recorded as a serious pest in Java, also caused considerable damage. *Euphorus helopeltidis*, the Brachinid parasite of *Helopeltis*, occurs in various areas and also parasitises *Pachypeltis*.

Ballard (E.). **Fifth Entomological Progress Report (Australia), Season 1925-1926.**—*Empire Cotton Growing Rev.*, iii, no. 3, pp. 276–279. London, July 1926.

Early sown crops of cotton were affected to a greater or less degree by a cutworm, *Euxoa radians*, the larvae of which eat the leaves and in some cases cut the stems. The attack can generally be checked by the use of arsenical baits or paradichlorobenzene, though the latter is rather expensive. Considerable damage was done by *Heliothis obsoleta*, but where a trap-crop of maize had been planted, the moths oviposited on this instead of on the cotton, and thus the first-formed squares at least were saved. The maize trap-crop is cut green before it matures and stored in a stack silo for use as fodder. It is hoped that at the end of the season it will be possible to compare the cost of this method of protection and that of dusting with calcium arsenate, also to ascertain whether the maize crop is sufficient to trap *Dichocrocis* (*Conogethes*) *punctiferalis* (peach moth).

Ehrhorn (E. M.). **Reports of the Chief Plant Inspector, November, December 1925, January and February 1926.**—*Hawaiian Forester & Agric.*, xxiii, no. 1, pp. 17–20. Honolulu, January-March 1926.

The pests intercepted during the period under review included: From California, *Pseudococcus* sp. on *Coleus*; *P. maritimus* and *P. gahani* on persimmon; *P. citri* and *Orthezia insignis* on ornamental plants; *Chrysomphalus aurantii* on citrus leaves; *Pieris* (*Pontia*) *rapae* and Aphids on cabbage; and thrips on persimmon fruit. From Pennsylvania, *Lecanium* sp. on *Lonicera grandiflora*. From Virginia, Coleopterous larvae in dry chestnuts. From Texas, *Cremastogaster* sp. on *Atriplex* sp. From the Philippines, *Monomorium pharaonis* on roots of nutgrass; and *Ponera* sp. on palm grass. From Fiji, weevil larvae, mealybugs and Lepidopterous larvae on yams. From Samoa, *Necrobia rufipes* and Dermestid larvae on coconut sacks; and moth larvae in seeds of *Adenanthera pavonina*. From Japan, Lepidopterous larvae in dry chestnuts and yams; *Hemichionaspis aspidistrae* on tangerine fruit; Bruchids in seeds of *Ipomoea*; *Aiolomorphus rhopaloides* in bamboo brooms; *Lepidosaphes* sp. and mealybugs on sandpears [*Pyrus sinensis*]; and Aphids on chrysanthemums and horseradish. From China, Lepidopterous larvae in garlic; Monophlebid larvae, *Pseudococcus* sp. *Parlatoria* sp., *Lepidosaphes* sp., and *Aspidiotus* sp. on citrus plants; *Rhizopertha dominica* on rice; termites in books; Aphids on *Caladium*; *Omphisa anastomosalis* on sweet potato; *Aiolomorphus rhopaloides* in bamboo brooms; and *Lepidosaphes* sp., *Chrysomphalus* sp., *Saissetia* sp., and *Aspidiotus* sp. on *Cycas revoluta*.

DOZIER (H. L.). **Some New Porto Rican Scale Parasites (Hymenoptera: Encyrtidae).**—*Proc. Ent. Soc. Wash.*, xxviii, no. 5, pp. 97–102, 4 figs. Washington, D.C., May 1926.

The species described are *Mercetiella reticulata*, gen. et sp. n., and *Euaphycus portoricensis*, sp. n., reared from *Asterolecanium pustulans* and *Acerophagus nubilipennis*, sp. n., reared from *Pseudococcus adonidum* and *P. citri*.

BARRETO (B. T.). **El gusano de cartucho.** [The Bag Worm.]—*Mem. Soc. cubana Hist. nat. "Felipe Poey,"* vi, no. 3–4, pp. 108–110, 1 pl. Havana, 1924. [Recd. June 1926.]

The Psychid, *Oeceticus poeyi*, Lucas, is one of the worst pests of trees in Cuba, attacking a large variety of fruit trees. Spraying with lead arsenate, 1 lb. to 50 gals. water, is the measure recommended against it except in the case of quite young plants on which the collection of the caterpillars is easily effected.

MAGARINOS TORRES (A. F.). **Defesa Sanitaria Vegetal.** [The Brazilian Plant Protection Service.]—*Minist. Agric. Ind. e Comm., Inst. biol. Defesa agric.*, Bol. 5, 80 pp., 2 pls. Rio de Janeiro, 1925. [Recd. June 1926.]

This is a brief description of the Brazilian Plant Protection Service. Various decrees and orders issued in 1922–1925 are reproduced.

HOFFMANN (C. C.). **Las migraciones de la langosta** (*Schistocerca paranensis* **Burm.) y contribucion al conocimiento de sus movimentos en Mexico.** [The Migrations of *S. paranensis* and a Contribution to the Knowledge of its Movements in Mexico.]—*Mem. y Rev. Soc. cient. "Antonio Alzate,"* xliv, no. 3–8, pp. 191–227, 19 refs. Mexico, 1925. [Recd. Feb. 1926.]

This is a general discussion of the distribution of *Schistocerca paranensis*, Burm., in Mexico, based mainly on the data collected by the special committee [*R.A.E.*, A, xiii, 410]. This locust is a typically tropical insect, its distribution being dependent upon the warmth and humidity of the climate. The supposed solitary phase of the locust, represented by *S. americana*, Scud., is more widely distributed than the swarming one, *S. paranensis*, which can develop only in especially favourable districts. Since oviposition takes place in soft, damp soil, areas under cultivation are particularly favourable for the development of the swarming phase, the increase of which is, therefore, directly dependent on agriculture. An exact and detailed study of centres of development of the migratory phase, as well as of the inter-relation between this and the solitary one, is strongly urged.

Locusts.—*Res. Dcvmpt. Cyanogas Calcium Cyanide*, Sect. 7, pp. 31–51, 3 tables, 6 figs. New York, N.Y., The American Cyanamid Co., 1926.

As a result of experiments in Argentina in 1924 and 1925, the Argentine Government have given official approval for the use of Cyanogas calcium cyanide for the control of *Schistocerca paranensis*. First instar hoppers, 1–5 days old, may be easily dusted with a sifter and a small amount of dust, the best type of sifter being one with a mesh large enough to allow distribution at the rate of 1 lb. to 320 or 350 sq. ft. Cyanogas "A" dust [*R.A.E.*, A, xiv, 74] was just as effective when used with an equal amount of talc, but calcium cyanide flakes were not satisfactory. The same dust was used successfully against hoppers from 5 to 12 days old when these were massed in tall grain, weeds or grass, which help to maintain a high concentration of the gas. The dust is not satisfactory when the insects are in short grass. The best time for dusting is in the early morning, provided that the plants are dry, or late in the evening when there is very little wind and the sun is setting.

Experiments were carried out in California against *Camnula pellucida*, Scud., using Cyanogas calcium cyanide granules. The material was applied by means of a sifter and a wheelbarrow seeder with a 14 foot boom ; it was effective when applied at the rate of 200 to 300 lb. per acre, the heavier dosages being required for the older hoppers. Calcium cyanide "A" dust was just as effective when applied by means of a duster, but its efficacy is decreased by the wind to a greater extent than is that of the granular material.

Experiments are now being carried out in Spain against *Dociostaurus* (*Stauronotus*) *maroccanus*. A dose of about 1 lb. to 175 sq. ft. appears to be necessary under the open conditions existing there.

VANDERPOOL (T. C.). **Streak or Winter Blight of Tomato in Quebec.**—*Phytopathology*, xvi, no. 5, pp. 311–331, 3 figs., 22 refs. Lancaster, Pa., May 1926.

Experiments in the transmission of streak disease of tomato proved that Aphids are the vectors of the disease. In over 75 per cent. of the plants symptoms of the disease appeared. Similar experiments with whiteflies gave negative results.

Bird (R. D.). **The Life History of the Saskatoon Sawfly** (*Hoplocampa halcyon*, **Norton**).—*Sci. Agric.*, vi, no. 10, pp. 353–357, 3 figs., 9 refs. Ottawa, June 1926.

The fruit of *Amelanchier spicata* (saskatoon), which is probably more used as a preserve than any other fruit except raspberry on the Canadian prairies, is severely injured by the larvae of the sawfly, *Hoplocampa halcyon*, Nort., which appears to infest this fruit wherever it occurs. In Manitoba the damage has amounted to 25 and 35 per cent. of the crop. The stages are described. The egg is laid in a sepal of the flower, usually under the inner epidermis, but sometimes under the outer. If more than one egg is laid in a flower only one survives. Oviposition continues from the time the petals begin to unfold until they fall, that is, for 2 or 3 days ; as soon as the petals drop the sepals curl back and harden, and when they are in this condition the sawflies will not oviposit. The adult life of the sawfly coincides approximately with the period of flowering of the food-plant, which lasts from 15 to 20 days. In 1925 the eggs hatched in 10 days ; in a better season the period might be somewhat shorter. Immediately after hatching the larva eats its way into the centre of the fruit, always entering between the sepal in which the egg was laid and the remains of the pistil. The larva passes through five instars, at the end of which three berries have generally been devoured in turn. It then crawls out through the entrance hole, drops to the ground and burrows from one to three inches below the surface, according to the hardness of the ground, where it spins a cocoon and enters a resting state before pupating in the following spring. The pupal period lasts only a few days, the time of emergence of the adult depending on weather conditions, but generally occurring late in May. It always, however, coincides with the opening of the first flowers of the food-plant. The adults are very active in warm weather. The method of oviposition is described. No parasites have as yet been reared, but the larvae of several Ichneumonids or Braconids were observed in the cocoons ; birds and ants destroy a certain number of the sawflies, but the greatest factors in control are meteorological conditions that prevent maturing of the saskatoon fruit, a late frost being the most effective. Remedies have not as yet been tried. Adults could probably be killed by a contact spray of nicotine and oil emulsion in early morning, or with a poisoned sugar solution in the warm part of the day. Sprays of arsenic when the larvae are migrating would kill many. If cultivated fruits become infested, cultivation of the soil under the bushes in the autumn should kill many hibernating larvae.

Daviault (L. J.). **Le petit papillon blanc du chou dans la Province de Québec.**—*Sci. Agric.*, vi, no. 10, pp. 367–369, 3 refs. Ottawa, June 1926.

Pieris rapae, L. (cabbage white butterfly) is an important pest in Quebec, where cabbages are grown on a large scale. Cauliflower and, less frequently, radishes are also attacked, while in the spring the larvae live on wild mustard (*Brassica arvensis*) and shepherd's purse (*Capsella bursapastoris*). Early cabbage and cauliflower can be marketed before the larvae appear in numbers, and it is the autumn crop that is the most severely attacked. *Apanteles glomeratus*, L., and

Pteromalus puparum, L., are the most important parasites. Experiments in control proved lead arsenate dust to be the best remedy, as sprays do not adhere well to cabbage leaves.

Quarantine on account of the European Corn Borer and other dangerous Insects and Plant Diseases. Notice of Quarantine no. 41, with Regulations (2nd revision).—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 3 pp. Washington, D.C., 23rd April 1926.

The importation into the United States of the stalk and all other parts of maize, broom corn and related plants from all foreign countries is prohibited on account of *Pyrausta nubilalis*, Hb., and other dangerous insects. Broom corn, for manufacturing purposes only, may, however, be introduced under certain regulations as to baling and sterilisation, and *Sorghum* hay from Canada (with the exception of the Province of Ontario) and clean, shelled or threshed grain of the plants covered in the quarantine, from any country, are permitted entry, except those covered by special quarantine, without regulations or permits.

This quarantine, superseding No. 41 revised [*R.A.E.*, A, x, 595], came into force 1st June 1926.

A new Insect Enemy of the American Chestnut.—*Science*, lxiii, no. 1640, suppmt., p. xiv. Garrison, N.Y., 4th June 1926.

Cydia (*Laspeyresia*) *splendana*, Hb. (nut fruit tortrix) has been detected in shipments of chestnuts from Italy. The Federal Horticultural Board is considering the possibility of enforcing restrictive measures against the importation of European chestnuts.

[Fedorov (S. M.).] **Федоров (С. М.). The Biology of** *Theresia ampelophaga*, **Bayle, in the Crimea.** [*In Russian.*]—*Bull. Soc. Nat. Crimée*, viii (1925), pp. 121–144, 2 pls., 55 refs. Simferopol, 1926.

A detailed account is given of the country and conditions where these observations on *Theresia ampelophaga*, Bayle, were made. The information concerning the life-history and control have already been noticed from another source [*R.A.E.*, A, xiv, 227].

[Bogdanov-Kat'kov (N. N.).] **Богданов-Катьков (Н. Н.). Entomological Excursions in Vegetable Gardens.** [*In Russian*].—2nd edn., 196 pp., 231 figs., 10 pls. Leningrad, Govt. Pubn., 1926. Price *Rbl.* 3.

This book deals with the morphology and life-history of insect pests of vegetables with numerous keys.

[Kharitonov (D. E.).] **Харитонов (Д. Е.) On the Outbreak of** *Pieris brassicae*, **L., in the Government of Perm.**—*Bull. Inst. Recherches biol. Univ. Perm*, iv, pt. 8, pp. 383–385. Perm, 9th June 1926. (With a Summary in French.)

During the summer of 1923 *Pieris brassicae*, L., occurred in great abundance and caused much damage to cabbages in one district of Perm. This butterfly has never previously been recorded in large numbers from the Ural. Hardly any individuals could be found in the following year, presumably as a result of the collection of the larvae and the activities of the parasite, *Apanteles glomeratus*, L. During 1923 cabbages were also injured by *Barathra* (*Mamestra*) *brassicae*, L.

[GREZE (N. S.).] **Грезе (Н. С.). On the Question of the Regeneration Feeding in the case of** *Myelophilus* (*Blastophagus*) *minor*, **Hart.** [*In Russian.*]—Trud. Lesn. Opuitn. Delu Ukrainui [*Trans. Exptl. Forest. Ukraine*], pt. 5, pp. 3–31, 3 graphs, 1 pl., 21 refs. Kiev, 1926. (With a Summary in German, pp. 18–25.)

The fact that some bark-beetles feed in the crown of the tree and thus destroy the young shoots has been considered by some workers as merely supplementary feeding, while others look upon it as a regeneration feeding, renewing the functions of the reproductive organs after the first generation has been produced.

The author examined a large number of bark-beetles, including 500 *Myelophilus minor*, Hart., in order to determine the effect of this feeding on reproduction. The observations are described in detail, and it is concluded that regeneration feeding undoubtedly occurs, beginning at the end of the first oviposition and continuing until late autumn. As a result, of it some individuals are able to produce another generation in the following spring.

The effect of parasitic Nematodes on reproduction was also studied, but it was found that their presence in the host did not affect its reproductive organs unless they occurred in large numbers. Though over 23 per cent. of the beetles were infested with Nematodes, only 2 per cent. were thus affected.

With regard to the value of the destruction of fallen shoots as a method of controlling *M. minor*, there appears to be some difference of opinion. The number of beetles that occurs in these shoots varies according to weather conditions, and it is concluded that the burning of these is only of value in the late summer if done at the right moment and in the shortest possible time; in the autumn with a lower temperature, prompt treatment is not so essential.

[RUDNEV (D.).] **Руднев (Д.). The Biology of Barkbeetles.** [*In Russian.*]—Trud. Lesn. Opuitn. Delu Ukrainui [*Trans. Exptl. Forest. Ukraine*], pt. 5, pp. 32–67, 32 figs., 5 refs. Kiev, 1926. (With a Summary in German, pp. 68–69.)

The galleries of *Myelophilus minor*, Hart., are described, and the seasonal habits, with particular reference to the effect of feeding on the renewal of the functions of the reproductive organs (regeneration feeding), are discussed for various species of bark-beetles, from which t is concluded that *Ips proximus*, Eichh., *I. acuminatus*, Gyll., *I. sexdentatus*, Boern., *I. longicollis*, Gyll., *I. laricis*, F., *I. suturalis*, Gyll., and *Pityogenes bidentatus*, Hbst. (*bidens*, F.), after their first oviposition and having finished their regeneration feeding, may resume reproduction.

In the case of *I. longicollis*, actual reproduction for a second time was not actually observed owing to scarcity of material; it undoubtedly akes place in this species, as the females hibernate successfully and etain fully developed reproductive organs, though they have already produced their first batch of eggs. The other species mentioned usually finish their regeneration feeding and begin reproducing for the second time before the appearance of the beetles of the first generation, or in any case soon after. This results in the generations becoming mixed.

The time of appearance of the "corpora lutea" in females that have begun laying eggs varies in different species, and to some extent in individuals of the same species. It is discussed in detail for the different species dealt with.

As a result of overcrowding, any species, usually considered a secondary pest, may become a primary one; the same factor also produces variations in the formation of the galleries, and regeneration feeding may even occur in them.

[DOGEL' (V. A.) & EFREMOV (G. V.).] **Догель (В.А.) и Ефремов (Г.В.). An Attempt at a quantitative Survey of the Soil Fauna in a Conifer Forest.** [*In Russian.*]—*Trav. Soc. Naturalistes Leningrad*, lv, pt. 2, pp. 97–110. Leningrad, 1925. (With a Summary in German.) [Recd. June 1926.]

The results of a study of the soil fauna, including the insects, in a given area of a conifer forest are shown in a table.

[VLADIMIRSKIĬ (A. P.). **Владимирский (А. П.). Results of the quantitative Survey of the Fauna of individual Plants. I. A Count of the Fauna inhabiting the Leaves of Trees.** [*In Russian.*]—*Trav. Soc. Naturalistes Leningrad*, lv, pt. 2, pp. 111–136. Leningrad, 1925. (With a Summary in German.) [Recd. June 1926.]

Tables are given showing the insect fauna inhabiting the leaves of different species of deciduous forest trees at various times of the year.

[ARKHANGEL'SKIĬ (N. N.).] **Архангельский (Н. Н.). How to Protect Stores from Weevils.**—Sevkavkraĭzu. Kraev. Stantz. Zashchit. Rast. [*Reg. Plant Prot. Sta. N. Caucasus*], [Ser. B] no. 6, 2nd edn., 8 pp., 4 figs. Rostov-on-Don, 1925. [Recd. June 1926.]

This is a popular account of the life-history and control of the granary weevil [*Calandra granaria*, L.].

PREDTECHENSKIĬ (S. A.). **Instructions for the Study of the more important Pests of Agricultural Plants in the Astrakhan Region. Part 1.** [*In Russian.*]—Astrakh. Stantz. Zashchit. Rast. [*Astrakhan Plant Prot. Sta.*], 20 pp., 1 fig. Astrakhan, 1926.

This paper deals with the important Lepidopterous pests of orchards, viz., *Cydia pomonella*, L., *Hyponomeuta malinellus*, Zell., and *Nygmia phaeorrhoea*, Don.

[ANISHCHENKO (A.).] **Анищенко (А.).** *Melolontha melolontha* (*vulgaris*) **and** *M. hippocastani*. [*In Russian.*]—Sel'skokhoz. Bull. [*Agric. Bull.*], i, no. 8, pp. 6–7. Kishinev, May 1926.

An account is given of *Melolontha melolontha* and *M. hippocastani* in the Ukraine, showing the years of their greatest abundance and their seasonal history. The collection of adults is recommended as the best method of control ; others are deep ploughing or digging the larvae out of the soil.

[Luchnik (V. N.).] **Лучник (В. Н.). Note on the Egg Parasite of** *Barathra brassicae*, **L.** [*In Russian.*]—*Bull. Caucasian Plant Prot. Sta.*, no. 1, pp. 17–18, 4 refs. Rostov-on-Don, 1926.

During 1919 *Barathra brassicae*, L., occurred in the Stavropol region in large numbers, but the serious infestation that was expected on cabbages in the following year did not develop as almost 100 per cent. of the eggs were parasitised, probably by *Trichogramma semblidis*, Aur.

[Ryabov (M. A.).] **Рябов (М. А.). The Possibilities of applying the Parasitic Method of Control in the case of Granary Pests.** [*In Russian.*]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 1, pp. 19–50, 2 pls., 9 refs. Rostov-on-Don, 1926. (With a Summary in English, pp. 51–52.)

The more important parasites of the granary weevils, *Calandra granaria*, L., and *C. oryzae*, L., belong to the genus *Lariophagus*, of which *L. distinguendus*, Först., has so far been recorded from Russia. A detailed account is given of the various stages and habits of this Chalcid, as observed under laboratory conditions. The eggs are inserted into infested grain containing weevils of a suitable stage. Such grain is very carefully selected by the ovipositing adult, and its eggs are nearly always found in the grain containing adult larvae or prepupae and only rarely in that containing younger larvae or fresh pupae. As a rule the eggs adhere to the thoracic segments of the larva, but may occasionally be laid at some distance from it, among the excreta. The parasitised larvae are all more or less paralysed, and even if the parasitic egg is removed, they succumb in 14–20 days.

The eggs hatched in 1½–2 days during June in the laboratory with a mean daily temperature of 26–27°C. [78·8–80·6°F.] and in a dry atmosphere. In January at 15–18°C. [59–64·4°F.] and in a dry atmosphere they required 5–6 days. The duration of the larval stage also varies according to the daily temperature and the time of year. The total life-cycle in June from egg to adult lasted on an average 18–20 days.

No natural enemies of this valuable parasite have been noticed, and in the Northern Caucasus at least, its activities are not limited by *Pediculoides ventricosus*, Newp. [*R.A.E.*, A, x, 106]. Its artificial propagation is considered well worth while, particularly under local conditions, as in many of the storing places no other control measures could be applied. The economic value of this measure would be increased if the parasite could also be reared from *Sitodrepa panicea*, L., which infests products of less value than those attacked by *Calandra* spp.

A key is given to the species of *Lariophagus* parasitising grain-infesting beetles.

[Zakharov (L. Z.).] **Захаров (Д. З.). What frightens the Locust: Sounds or Movement?** [*In Russian.*]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 1, pp. 68–71, 4 refs. Rostov-on-Don, 1926.

In view of the common custom of endeavouring to divert a swarm of locusts by making as much noise as possible by beating on tin cans or any other handy object, experiments were made to ascertain whether it was the movement or the noise that frightened them away, but they proved inconclusive.

[Arkhangel'skiĭ (N. N.).] **Архангельский (Н. Н.). Some Observations on various Methods of controlling Pests of Stored Products.** [*In Russian.*]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 1, pp. 100–119, 2 figs., 13 refs. Rostov-on-Don, 1926.

The results of successful experiments on a small scale with carbon bisulphide were confirmed by large scale fumigation of big grain stores and those containing leather harness, etc., some of which was heavily infested by *Sitodrepa panicea*, L., flour paste having been used in its manufacture. As many parasites of grain insects are attracted to the light, any windows should be opened a few hours before fumigation in order to release them.

Calandra granaria, L., *Tribolium confusum*, Duv., *Silvanus surinamensis*, L., *Laemophloeus* spp., *Tyroglyphus farinae*, Koch, *Trombidium* (?) sp., and *Troctes* sp., were treated under experimental conditions, and all stages were killed by a fumigation with carbon bisulphide, 7½ lb. per 1,000 cu. ft., for 48 hours; under these conditions the gas will penetrate grain to a depth of over 6 ft., and flour to over 4½ ft. It is presumed that the eggs are also killed by fumigation, though this was only definitely proved in special experiments with *Anthrenus scrophulariae*, L., and *Trogoderma versicolor*, Cr. In granaries fumigated in October and carefully inspected in the following March no living insects were found.

[Lappin (G. I.).] **Даплин (Г. И.). The Economic Importance of Pests of Stored Grain in the North Caucasian Region.** [*In Russian.*]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 1, pp. 120–126, 9 refs. Rostov-on-Don, 1926.

As a result of a survey of the grain stores in the northern Caucasus the most important pests found were *Calandra granaria*, L., *Ephestia kühniella*, Zell., and *Sitotroga cerealella*, Ol. Others of general occurrence are *Tenebroides mauritanicus*, L., *Tyroglyphus* sp., and *Pyralis farinalis*, L.

[Dovnar-Zapol'skiĭ (D. P.).] **Довнар-Заиольский (Д.П.). The Stem Sawflies (Cephidae) of the North Caucasian Region.** [*In Russian.*]—*Bull. N. Caucasian Plant. Prot. Sta.*, no. 1, pp. 127–132, 1 map, 1 ref. Rostov-on-Don, 1926.

This list of 18 sawflies from the North Caucasian region includes in addition to *Cephus pygmaeus*, L., *C. brachycercus* var. *tibialis*, n., *C. rjabovi*, sp. n., *C. pseudopilosulus*, sp. n. (also from Siberia), *C. tanaiticus*, sp. n., and *C. infernalis*, sp. n., descriptions being given in Russian and German.

Zverezomb-Zubovskiĭ (E. V.).] **Зверезомб-Зубовский (Е. В.). Material for the Study of Pests and Diseases of Agricultural Plants of the former Don Province.** [*In Russian.*]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 1, pp. 137–139. Rostov-on-Don, 1926.

This is a list (37 titles) of literature supplementary to one previously oticed [*R.A.E.*, A, x, 283].

Sviridenko (P. A.).] **Свириденко (П. А.). The Work of the North-Caucasian Aviation Expedition for the Control of Locusts.** [*In Russian.*]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 1, pp. 81–99, 3 refs. Rostov-on-Don, 1926.

This is a preliminary account of the first campaign in the North aucasus against locusts with the use of aeroplanes. A detailed report s to be published later. Though owing to lateness in starting, the reliminary experiments originally planned could not be carried out, he campaign was quite successful, and the results show that it is thus ossible to destroy locusts in reed beds by dusting, such areas being naccessible to the usual methods of applying sprays or dusts. Of he various dusts tried Paris green and sodium arsenite gave the best esults when applied at the rate of 10–12 lb. to 3 acres if broadcast or –5 lb. if applied in strips. These dusts will penetrate dense reeds up o 16 feet high and adhere well to the foliage and even the stems.

Korotkikh (G. I.).] **Коротких (Г. И.). Experiments in the Use of Aeroplanes for the Control of Agricultural Pests.** [*In Russian.*]—*Défense des Plantes*, ii, no. 7, pp. 435–454, 10 figs., 2 refs. Leningrad, April 1926. [Recd. July 1926.]

This is a detailed account of preliminary investigations on the eneral technique of dusting from aeroplanes, the results of which led o trial campaigns for the actual control of pests [see preceding paper]. he structure and manipulation of the aeroplanes are described and llustrated, including the effect of wind and altitude on the distribution f the dust. Though American experiments indicate that it is best o use the aeroplanes for dusting on calm days, in these observations t was found that a slight wind can well be made use of by judiciously egulating the direction of the flight.

Pospelov (V. P.).] **Поспелов (В. П.). The Physiological Theory of Locust Migration.** [*In Russian.*]—*Défense des Plantes*, ii, no. 7, pp. 423–435, 9 refs. Leningrad, April 1926. [Recd. July 1926.]

This is a somewhat more detailed exposition of the author's views lready published [*R.A.E.*, A, xiv, 226].

Modestov (V.).] **Модестов (В.). Contribution to the Biology of** *Micronematus abbreviatus*, **Htg., and its Control.** [*In Russian.*]—*Défense des Plantes*, ii, no. 7, pp. 454–471, 12 figs. Leningrad, April 1926. [Recd. July 1926.]

A detailed account is given of all stages of *Micronematus abbreviatus*, Htg. This sawfly is entirely confined to pears, and the author was unable to induce it to feed or oviposit on apple, though it has been recorded from this food-plant. The eggs are inserted in the young leaves during the second half of May and beginning of June, and hatch in about 20 days. The larval stage occupies about 16 days, during which time the leaves become skeletonised. The first cocoons were found towards the end of June; they are made in the soil or on its surface in any suitable crack, and the larvae remain in them until the following spring. There is thus only one generation a year. Reproduction appears to be parthenogenetic, and no males were found under either natural or artificial conditions.

The parasites reared from *M. abbreviatus* were a Tachinid, *Ceromasia* sp., a Mycetophilid, and *Pezomachus postumus*, Först. Soft soap, 1 lb. to 4 gals. of water, gave excellent results against this pest.

[Shiperovich (V. Ya.).] **Шиперович (В. Я.). Conditions of Cultivated Plantations of Conifers and deciduous Trees of the Steppe Forests in connection with the Mass Distribution of Injurious Insects.** [*In Russian.*]—*Défense des Plantes*, ii, no. 7, pp. 472–475, 2 refs. Leningrad, April 1926. [Recd. July 1926.]

A short account is given of the more important insects attacking conifers and deciduous trees in the south-east of Russia, including *Diprion* (*Lophyrus*) *sertifer*, Geoff., attacking *Pinus* spp., which is parasitised by *Lamachus* (*Tryphon*) *lophyrorum*, Hart., and also attacked by *Botrytis* sp., and *Bacillus septicaemiae lophyri* [*R.A.E.*, A, xiv, 209]; *Myelophilus piniperda*, L., particularly injurious wherever *D. sertifer* occurs; *Rhyacionia* (*Evetria*) *buoliana*, L., causing stunting of pines; and *Sirex* (*Paururus*) *juvencus*, L., which infests 20-year-old pines, previously attacked by other pests.

The pests of deciduous trees are *Scolytus* (*Eccoptogaster*) *kirschi*, Skal., attacking elms; and *Zeuzera pyrina*, L., in mixed stands of elm, ash and oak.

[Mordvilko (A. K.).] **Мордвилко (А. К.). The Evolution of Cycles and the Origin of Migration in Aphids.** [*In Russian.*]—*Défense des Plantes*, ii, no. 7, pp. 476–484. Leningrad, April 1926. [Recd. July 1926.]

The author further discusses his theory of the migration of Aphids [*R.A.E.*, A, xiii, 105, 476]. He considers that these insects originated in temperate regions and have only comparatively recently reached the tropics, where the number of species is much smaller than in temperate zones. In the tropics there is also no sexual generation, whereas the characteristic cycle of generations of Aphids includes one sexual one, which terminates it, the primitive method of development of these insects being entirely sexual.

In tracing the evolution of the different forms, a number of examples are given. Those mentioned as producing winged females as well as winged males include *Drepanosiphum californicum*, sp. n. (*platanoides*, Wilson) from California. This species is not, however, further described.

STARK (V. N.).] **Старк (В. Н.). The Organisation of Scientific Investigational Work in Forest Entomology is essential.** [*In Russian.*]—*Défense des Plantes*, ii, no. 7, pp. 604–606. Leningrad, April 1926. [Recd. July 1926.]

The enormous damage done to forests by insect pests is pointed out, e numerical increase of some bark-beetles being given as examples. cientific research with a view to controlling such pests is essential, nd should be directed by a central station situated in the forest itself.

DOBRODEEV (A. I.).] **Добродеев (А. И.). The Principles of Forest Entomology. Report on the Organisation of Research Work in Forest Entomology and the Part taken in it by the Forest Entomology Section of the Institute of Experimental Agronomy.** [*In Russian.*]—*Défense des Plantes*, ii, no. 7, pp. 607–613. Leningrad, April 1926. [Recd. July 1926.]

In these two papers a brief outline is given of the needs and scope f forest entomology, with a short summary of the work planned by e Section of Forest Entomology of the Institute of Experimental gronomy.

CHRADER (F.). **Notes on the English and American Races of the Greenhouse White-fly** (*Trialeurodes vaporariorum*).—*Ann. App. Biol.*, xiii, no. 2, pp. 189–196, 5 figs., 7 refs. Cambridge, May 1926.

American investigators have reported that the unfertilised eggs of *rialeurodes vaporariorum* in that country give rise to males only, hile in England it has been shown that they result in females only *cf. R.A.E.*, A, xiii, 588]. The conclusion was therefore reached that here are two races. Experiments in 1922 indicated, however, that in he Lea Valley the reproduction resembled that in the American ace. Examination of random collections in England reveal the act that the great preponderance of females recorded by previous nvestigators no longer obtains; in fact, the sex-ratios were similar o those found by several workers in America. It is not justifiable, owever, to conclude that the American race has supplanted the nglish race in the various districts examined; extensive breeding xperiments are required before this point can be determined. The resent investigation revealed that this Aleurodid has only been a erious pest in England within the last 15 years. The American race s undoubtedly spreading rapidly to all places where it was formerly nknown; apparently it either reproduces at a greater rate or is more esistant to detrimental environmental factors than the English one. tremendous increase in the growing of tomatos might be the cause of he preponderance of one race over the other, or it is possible that nterbreeding between the English and American races may have roduced a more vigorous strain. Both races have been found in enmark, but the author could not discover any in greenhouses in ermany.

OBERTS (A. W. R.). **On the Early Stages of some Weevils (Curculionidae). Part i.**—*Ann. App. Biol.*, xiii, no. 2, pp. 197–218, 24 figs., 17 refs. Cambridge, May 1926.

The larvae of many weevils bear such a strong resemblance to each ther that previous descriptions have frequently proved inadequate for determining them. The author is therefore attempting to fill in some of the gaps regarding the early stages, and deals particularly with those species that spend their larval life in the soil. The characters that have proved most useful for differentiating the larvae are the spiracles, the cuticular armament, the antennae and the presence or absence of ocelli. The species here dealt with include *Phyllobius urticae*, DeG., of which the common food-plant is apparently nettle, though the larvae have also been found at the roots of strawberry plants. Pupation occurs a little below the surface of the soil from the middle to the end of March, the adults emerging from 3 to 4 weeks later. Eggs are probably laid in May and June. One larva was found attacked by a fungus of the genus *Beauveria*, which also attacks the aerial larva of *Apion apricans*, Hbst., on clover. The larvae of *P. pyri*, L., which has been taken on the roots of *Populus nigra* and also on dock (*Rumex*), is also described, as well as that of *Polydrosus cervinus*, L., normally infesting grass roots.

Hodson (W. E. H.). **On the Occurrence of** *Centor myopinus* **Meig., as a Pest on Oat.**—*Ann. App. Biol.*, xiii, no. 2, pp. 229–230. Cambridge, May 1926.

In May 1925, a field of spring oats was found to be dying off in consequence of attack by the Chloropid, *Centor myopinus*, Mg. This fly, which somewhat resembles *Chlorops taeniopus*, Mg., is described. The damage done is rather similar to that caused by wireworms, the larvae tunnelling the centre of the tillers and consuming the growing points. Infested plants were conspicuous owing to their yellow appearance, and as many as 50 per cent. were attacked in some areas. The larvae pupated in the base of the injured shoots at about ground level ; the adults began to emerge in mid-June and continued to appear until the end of that month. The numbers of the sexes were about equal, males living for about 10 days in confinement and females somewhat longer. For the summer generations it is probable that there is some food-plant other than oats.

Hodson (W. E. H.). **Observations on the Biology of** *Tylenchus dipsaci* **(Kühn) Bastian, and on the Occurrence of Biologic Strains of the Nematode.**—*Ann. App. Biol.*, xiii, no. 2, pp. 219–228, 9 refs. Cambridge, May 1926. [Abridged as :] **Notes on the Stem Eelworm.**—*Jl. Minist. Agric.*, xxxiii, no. 3, pp. 259–262. London, June 1926.

An account of the life-history of *Tylenchus dipsaci*, Kühn (stem eelworm), and the injury that it causes to various plants, is given. The two chief means by which this eelworm is spread are migration in an active state from plant to plant through the soil and survival of dormant forms in the dead leaves of the food-plant after the latter have withered. The eelworms are capable of living in a desiccated or dormant state for several years before they again become active and enter fresh plants, but it is doubtful whether they are able to live for more than a few months in an active state in the soil. It has been found that in the case of individuals attacking oats, *T. dipsaci* has a third means of spread, as dormant forms have been found between the grain and the husk.

Notes are given on the theory of the occurrence of biological races n *T. dipsaci* [*cf. R.A.E.*, A, xiii, 618, etc.]. Although *T. dipsaci* attacks strawberries in America, the author has never found it in strawberries grown alternately with narcissus in a district where the bulbs of the latter are frequently attacked by eelworms ; similarly he has never found eelworms in oats grown on land previously occupied by heavily infested narcissus bulbs. Field experiments have tended to confirm this theory. Strips of 12 varieties of red clover were sown across a field which, for the two previous seasons, had produced oats heavily infested with the Nematode. A few oat seedlings resulting from the previous crop were heavily infested, but the clover showed no sign of attack. Large numbers of infested bulbs were then broken up and broadcast on a clover ley that contained many kinds of clover ; no attack by Nematodes occurred within six months, though reinfection of narcissus bulbs was carried out with some of the same material.

Attempts were then made to transfer strains of the Nematode from one food-plant to another under controlled conditions. A number of cylinders were infested heavily with a known race of the Nematode and various alternative food-plants were then sown, including, in most cases, some of the original food-plant of the particular race present. Examination at monthly intervals showed that reinfestation of the original food-plant occurred almost without exception, while there was definite evidence that the Nematode has a difficulty in attacking any plant other than the one on which that strain has previously been feeding. Entry into other plants was frequently effected, but the Nematodes seemed unable to establish themselves, and when taken from these were found to be transparent, resembling individuals that had been starved in distilled water for long periods, the alimentary canal being empty in both cases. Many disappeared from the plants after a few weeks, having probably died, but those that survived for months might reasonably be expected to adapt themselves eventually to the new plant. That this incapacity for adaptation is not invariable is borne out by the fact that one of the strains used was equally able to live on oats and cocksfoot [*Dactylis glomerata*], though apparently unable to attack clover. Experiments now in progress indicate that the ability to transfer from one food-plant to another probably depends very largely upon the length of time that one particular food-plant has been utilised. The more adaptable strains do not, as a rule, appear to cause such severe injury to plants attacked as do those that have concentrated on one particular food. While the practical significance of the data so obtained is not, as yet, conclusive, the indications are that if a strain has been infesting a particular food-plant for two years or more, its subsequent attack on another susceptible crop will be so slight as to be negligible.

IMMS (A. D.). **The Use of the Aeroplane for applying Insecticides.**—*Jl. Minist. Agric.*, xxxiii, no. 3, pp. 205–210, 2 pls., 9 refs. London, June 1926.

This is a brief review of work that has been done in various parts of the world with aeroplanes for applying insecticidal dusts, based mainly on papers on the subject that have been noticed in this *Review*. In England there are comparatively few large areas devoted to the cultivation of a single crop, so that the possibilities of using aeroplanes for insect control are limited, but they might be extended by the introduction of aeroplanes capable of landing and operating in a confined area.

PETHERBRIDGE (F. R.) & WESTON (W. A. R. D.). **Trials of Tar-distillate Washes in East Anglia.**—*Jl. Minist. Agric.*, xxxiii, no. 4, pp. 332–338. London, July 1926.

The properties of commercial varieties of carbolineum are briefly discussed, and details are given of the results of several series of experiments in spraying apples and plums with similar proprietary tar-distillate washes in winter for the control of Lepidopterous pests, rosy apple aphis [*Anuraphis malifoliac*, Fitch] and leaf-curling plum aphis [*A. helichrysi*, Kalt.] Several of the washes gave almost complete control over the Aphids and considerably reduced the infestation by Lepidopterous larvae as determined by examinations in the spring. Some, however, gave only very slight control over any of the pests, and none was successful in controlling red spider, which was prevalent on both plums and apples, and which even appeared to be more common on sprayed trees than on unsprayed ones. Certain washes, when applied to plums on February 12th, damaged the flower buds so severely that on some varieties over 90 per cent. dropped off, thus emphasising the importance of spraying before the buds begin to swell. Apples sprayed at the same time were not injured, and no injury to plums sprayed in November, December and January was observed.

It was noticed that trees, particularly plums, sprayed with certain washes produced much more luxuriant foliage in the following summer than unsprayed trees, and it was found that the average weight of the plum leaves from these sprayed trees was from 7 to 94 per cent. greater than that of leaves from unsprayed trees, and that they were also darker green in colour.

The hard waters of the Wisbech district were found to be unsuitable for use alone with certain tar-distillate washes, as they caused the emulsion of the latter to break down so that a brown oily substance separated out, but it was found that the addition of 0·2 per cent. of gelatine, or the equivalent amount of glue or size, prevented this.

FRYER (J. C. F.). **The Apple Fruit Miner and the Apple Fruit Fly.**—*Jl. Minist. Agric.*, xxxiii, no. 4, pp. 339–342, 2 pls. London, July 1926.

Brief descriptions are given of *Argyresthia conjugella*, Zell. (apple fruit-miner) and the American *Rhagoletis pomonella*, Walsh (apple fruit-fly), their life-histories, and the nature of the damage that they cause to apples, in view of the fact that *A. conjugella* in English apples has sometimes been mistaken for *R. pomonella*, giving rise to a fear that the latter had been introduced into the country. *A. conjugella*, although not an uncommon moth in England and Wales, is rarely a pest of importance in the chief apple-growing districts, but sometimes causes considerable losses in Northumberland and Westmoreland and in Scotland [*R.A.E.*, A, xiv, 111]. It also occurs in Japan and is a serious pest of apple in North Europe and parts of Canada; it is probably indigenous in all the cooler parts of the Northern Hemisphere where mountain ash [*Sorbus aucuparia*] and crab apple occur.

Jenkins (J. R. W.). **Notes on the Insect Pests of Red Clover in Mid and West Wales.**—*Welsh Jl. Agric.*, ii, pp. 221–228, 1 pl. Cardiff, January 1926. [Recd. July 1926.]

During a survey of the insect pests of Mid and West Wales special attention was paid to the pests of red clover [*Trifolium pratense*], which besides being a pasture plant and forage crop, is grown for seed in certain districts. The adults of *Apion assimile*, Kby., *A. trifolii*, L., *A. virens*, Hbst., *A. apricans*, Hbst., *A. tenue*, Kby., *A. nigritarse*, Kby., and *A. dichroum*, Bed., feed on the leaves. The most common species are *A. assimile* and *A. trifolii*; the larvae of these and of *A. apricans*, an uncommon species, feed on the developing seeds in the flower heads. The larvae of *A. virens*, which is fairly common, feed in the stems. The remaining species occur very sparingly.

Sitona (*Sitones*) *sulcifrons*, Thunb., sometimes causes considerable injury in the spring, particularly to seedlings; the larvae feed on the root nodules and rootlets, and the adults on the leaves. *S. hispidula*, F., *S. lineata*, L., *S. crinita*, Hbst., and *S. flavescens*, Marsh., are also found on red clover and cause similar injury. *Hypera* (*Phytonomus*) *nigrirostris*, F., frequently damages the foliage and flower heads, the adults chiefly attacking the former and the larvae chiefly the latter. *H.* (*P.*) *trilineata*, Marsh., also occurs frequently and *H.* (*P.*) *punctata*, F., occasionally; *H.* (*P.*) *rumicis*, L., and *H.* (*P.*) *polygoni*, L., which were also found, probably only occurred on red clover accidentally.

No Lepidopterous pests of importance were recorded, but larvae of *Phytometra* (*Plusia*) *gamma*, L., *Euclidia glyphica*, L., *E. mi*, Clark, *Zygaena trifolii*, Esp., *Z. lonicerae*, Scheven, and *Z. filipendulae*, L., occurred in small numbers.

Two Cecidomyiids were observed injuring red clover, but others probably occur. *Amblyspatha ormerodi*, Kieff. (clover midge), the larvae of which feed in the apical tissue of the side shoots near the ground, causing them to rot, almost destroyed a clover crop in one district; and *Perrisia* (*Dasyneura*) *leguminicola*, Lint. (clover seed midge), the larvae of which feed on the developing seeds, is generally distributed.

The Aphids, *Macrosiphum pelargonii*, Kalt. (*malvae*), *Illinoia* (*Macrosiphum*) *pisi*, Kalt., *Myzus circumflexus*, Buckt., and *M. persicae*, Sulz., commonly infest the leaves, but only *M. persicae* was found in large colonies. *Anuraphis warei*, Theo., which attacks the flower heads, is common and sometimes injurious. Four plant-bugs, *Lygus pratensis*, L., *Calocoris norvegicus*, Gmel., *Miris calcaratus*, Fall., and *M. laevigatus*, L., are common on red clover and sometimes very numerous.

Details are given of a method of estimating the effect on the subsequent growth of clover of attack by *Sitona sulcifrons* in the seedling stage, and it is concluded that semi-defoliation of the seedlings, such as is caused by this weevil, causes a loss in seven months of 28·7 per cent. of the total green weight and 30·7 per cent. of the total number of flower heads. Field observations on clover seedlings showed that 65 per cent. had not been attacked and 29 per cent. had been attacked on one or both cotyledons by *S. sulcifrons*, the average defoliation of the injured plants being estimated as 38·7 per cent. On the basis of the results obtained with artificially defoliated plants, this would cause a loss of 7·8 per cent. in the total green weight of the crop at the end of seven months. It still remains to be determined whether the injury to the seedlings affects the plant throughout its life; and also what the effect of this and of insect injury in subsequent stages of growth may be on the final weight of hay or seed produced.

THOMPSON (H. W.). **Leatherjackets and their Control.**—*Welsh Jl. Agric.*, ii, pp. 228–233, 2 refs. Cardiff, January 1926. [Recd. July 1926.]

During the early part of 1925 serious damage to autumn-sown wheat and spring-sown oats was caused by Tipulid larvae in parts of Glamorgan and Monmouthshire ; in every case examined the injury followed the breaking up of a ley. In South Wales a ley is rarely ploughed up before the crane-flies lay their eggs, in the summer, so that the eggs or young larvae are already present in the turf at the time it is turned in. In a field of autumn wheat, in which the attack was severe but restricted to definite areas, a dressing of naphthalene, applied at the rate of 2 cwt. an acre on a strip five yards wide bordering a badly infested area on 14th February, prevented the spread of the larvae from the infested to the uninfested area beyond the treated strip. Kainit applied at the rate of 4 cwt. an acre to another badly infested field at the same time had no effect on the larvae.

A poisoned bait made by adding a solution of sodium fluoride, 1½ oz. in 1 gal. water, to 20 lb. bran until the latter was thoroughly moistened but not sufficiently wetted to cause it to cohere when handled, was ineffective against leatherjackets, being apparently distasteful to them. Another bait made by mixing 20 lb. bran and 1 lb. Paris green and adding sufficient water to moisten it (about 1 gal.) was then tested, this amount being enough for 1 acre. The first experiments with this bait were satisfactory, and it was subsequently used on five other farms during March, April and May. In the whole series of tests, examination of the treated fields two or three days after the application of the bait showed that the average number of larvae killed was about 77 per cent.; the actual percentages ranged from 57 to 92, the latter in a field that had been rolled with a Cambridge roller on the previous day, this being probably responsible for about 20 per cent. of the dead larvae, as determined by an examination of the untreated part of the field. Although detailed counts of dead and living larvae were not made more than three days after the application of the poisoned bait, it probably remains effective for considerably longer. In one case dead larvae were found after nine days, and the poisoned bran was plainly noticeable on the surface of the ground.

Care must be exercised in the use of poisoned bran in fields, as by law it may only be employed where " all reasonable precautions to prevent access thereto of dogs, cats, fowls, or other domestic animals " are taken.

MORTON (J. W.). **Practical Spraying.**—8vo., 48 pp. London, Ernest Benn, Limited, 1926. Price 2*s*. 6*d*.

This booklet, written for the use of fruit-growers and farmers, contains much useful information of a practical nature that is frequently omitted or insufficiently stressed in more technical treatises. The sections of interest from the entomological standpoint deal with precautions necessary in spraying, winter washes for fruit trees, insecticides, combined washes, dusting, spraying hops, grease-banding, soil and greenhouse fumigation, spraying machinery, and a few important pests of fruit.

The author states that he has confined his attention to remedies that have been tried and proved, omitting those that are still in the experimental stage.

MASSEE (A. M.). **Entomology. Programme of Research with Brief Progress Reports.**—*Ann. Rept. East Malling Res. Sta. 1925,* xiii, pt. 1 (general), pp. 73–75. East Malling, Kent, June 1926.

The proprietary tar-distillate washes tested all controlled the eggs of the hop-damson aphis [*Phorodon humuli*, Schr.] to a considerable extent, although not completely. They were none of them effective against red-spider eggs.

Apple seedlings have been selected that show marked resistance to *Aphis pomi,* DeG. (permanent apple aphis) ; it is intended that the resistance of stocks derived from these shall be studied, also the resistance of the seedlings themselves to *Eriosoma lanigerum,* Hausm., (woolly aphis) and other pests. Stocks of mazzard cherry (*Prunus avium*) resistant to *Myzus cerasi,* F. (cherry aphis) have been selected for observation ; apple seedlings and scions resistant to *E. lanigerum* are also being studied.

Black currants partly resistant to *Eriophyes ribis,* Nal. (black currant gall-mite) have been raised ; they do not develop normal " big buds." The evidence in favour of " reversion " of black currants being transmitted by *E. ribis* is almost conclusive, and the lime-sulphur spray that controls the mite is controlling the spread of reversion.

MASSEE (A. M.). **The Control of the Black Currant Gall Mite** (*Eriophyes ribis* **Westw., Nalepa**).—*Ann. Rept. East Malling Res. Sta. 1925,* xiii, pt. 1 (general), pp. 76–80, 2 pls., 2 refs. East Malling, Kent, June 1926.

A summary is given of the results of investigations on the control of *Eriophyes ribis,* Nal., carried out at East Malling during the past five years, much of the information having been previously noticed [*R.A.E.*, A, xii, 505 ; xiv, 52]. The rapid spread of the mite in Britain that has apparently taken place since it was first recognised about 1850 is accounted for both by the distribution of infested bushes from nurseries and by the carriage of the mites migrating from the old buds in the spring by wind, Aphids, and Coccinellids. A single bush infested with *E. ribis* has been known to infect all surrounding healthy bushes in four years.

In connection with the practice of cutting down alternate rows of black currant bushes in alternate years for the control of *E. ribis,* it was noticed that the buds remaining at the base of the bushes so cut were infested with mites, and that these buds, as well as the adjacent rows of untreated bushes, served to infest the buds of the new wood in the spring. In view of this, the stumps of a number of bushes that had been cut down during the winter were sprayed with lime-sulphur, 1 in 12 (*i.e.* 1 part of lime-sulphur to 11 of water), specific gravity

1·025, on 30th March. Considerably less "big bud" developed on the bushes that grew from the stumps so treated than on those from untreated stumps.

The most satisfactory method of controlling *E. ribis* is by spraying the bushes with lime-sulphur at the above strength at the time that the mites are migrating from the old buds in the spring; for this to be successful it is essential that the spraying should be done at the right time, as soon as the flower racemes appear but before the flowers open. This spray not only kills the mites that emerge from the buds in which they have passed the winter, even a month after it has been applied, but also destroys those that have already emerged from the buds and are living on the leaves before attacking the young buds a few weeks later. It is estimated that the cost of spraying, taking all expenses into consideration, is about £4 10s. an acre of 1,210 bushes, or less than 1d. a bush.

PETCH (T.). **Studies in Entomogenous Fungi. viii. Notes on** *Beauveria*.—*Trans. Brit. Myc. Soc.*, x, pt. 4, pp. 245–271, 1 fig., 30 refs. Cambridge, 25th February 1926. [Recd. June 1926.]

The author gives the history of the species of *Beauveria*, which have been recorded in the past under various names. He discusses the morphology and classification and describes the culture of these fungi on a number of different media, which do not, however, produce permanent cultural characters. If the type of growth in culture and the coloration of the culture media are to be accepted (as in the past) as specific characters, then all the strains reared in the present investigation must be regarded as different species. It might be expected that each species of insect would then have a particular species of *Beauveria* parasitic upon it. It is known that certain insects may be attacked by more than one species of *Beauveria*, consequently there opens up the prospect of an illimitable series of species of this genus. It has hitherto been supposed that *Beauveria* spp. are pleophagous, and many records are quoted bearing on this question. Where infection experiments have been attempted these undoubtedly point to pleophagy, and it does not seem probable from the recorded experiments that the parasitism of a given species of *Beauveria* is restricted to one species of insect or even to one group of insects.

Protection des Colonies françaises contre le "Ver rose" du coton.—*Agron. colon.*, no. 99, pp. 142–143. Paris, March 1926.

An Act dated 22nd February 1926 repeals previous ones in connection with the protection of cotton from *Platyedra* (*Gelechia*) *gossypiella*, Saund., in the French colonies. It forbids the importation into or movement in all French colonies, except Madagascar, of any plant or part of such that may carry the pink bollworm (particularly *Hibiscus* and *Bauhinia*), from Egypt, East Africa, Nigeria, Sierra Leone, Asia, Brazil, Mexico, Hawaii, the British Antilles, Madagascar, Texas, Louisiana, New Mexico and countries where the importation of such plants is not under control. Importation is permitted from other countries with a certificate as to freedom from infestation in the country of origin.

Yothers (W. W.). **Some Important Entomological Features in the Citrus-growing Regions of the United States.**—*Florida Ent.*, x, no. 1, pp. 1–4. Gainesville, Fla., April 1926.

Beneficial entomogenous fungi are a great factor in the cultivation of *Citrus* in Florida, and growers either depend wholly on their work or plan their spraying as supplementary to them. There is no important pest of *Citrus* in Florida that has not some fungus attacking it. Louisiana and southern Alabama, with a similar climate to that of Florida, have the same pests and the same entomogenous fungi; in Southern Alabama, however, *T*[*etranychus*] *citri* (purple mite) does considerable damage to Satsuma oranges in winter and late spring, this being a preferred food-plant; in Louisiana entomogenous fungi are relied upon to keep whiteflies and scale-insects in check. In Texas, owing to lack of heavy and regular rainfall during summer, entomogenous fungi do not thrive, although they have been introduced from Florida many times, but little injury is caused by insects. In Arizona, there are no Coccids, whiteflies or rust mites [*Phyllocoptes oleivorus*] on the trees or fruit, and only a few individuals of *Tenuipalpus californicus* were found as a result of search. This lack of pests is probably due to heat and the absence of humidity. In California, the citrus aphis, *Aphis pomi* (*spiraecola*), is generally confined to the section along the coast, but in some years of cold springs it invades some of the groves on higher land, doing a good deal of damage for short periods. In one district, the black scale [*Saissetia oleae*] and the red scale [*Chrysomphalus aurantii*] appear to have developed resistance to fumigation with hydrocyanic acid gas after 30 to 35 years; if this is so, an entirely new field is opened up in insect biology, and the indications are that artificial control may be comparatively short-lived.

Entomological Work of the Year.—*Rept. California Agric. Expt. Sta. 1924–25*, pp. 43–46 & 51–53. Berkeley, Cal., 1926.

Many different fractions of lubricating oils and kerosenes have been tried against Coccids on *Citrus*. A highly refined white lubricating oil has been found the most safe and effective for use at summer temperatures on both *Citrus* and deciduous trees; this is particularly useful against *Chrysomphalus aurantii*, Mask. (red scale), but has some effect on the rind of *Citrus* fruits, particularly lemons. It has been found that the greater the amount of emulsifier used, the less is the killing efficiency of the spray. By reducing the amount of calcium caseinate to 0·5 per cent. of the oil used, it was found that a quick breaking type of emulsion was produced. As low as 2 per cent. of the lubricating oil was thus found to be effective. A study of the penetration of liquids into the tracheal system of *C. aurantii* has shown that oil emulsions themselves seldom penetrate; it is only as the oil separates out of the emulsion that penetration into the body of the scale is possible, hence the desirability of the quick-breaking type of emulsion.

Calcium cyanide drilled in the furrows as the ground was ploughed, at the rate of 600 lb. or more an acre, controlled Nematodes and stimulated the growth of tomatos. This material was also effective against the grape leafhopper [*Erythroneura comes*, Say] early in the spring when the plants had been in leaf for three or four weeks. Larger amounts must be used as the vines extend in growth later in the season.

Beneficial insects introduced against *Citrus* pests are the Coccinellids, *Chilocorus kuwanae*, Silv., and *Notolipernes* sp., predacious on Coccids, and *Leis* sp., a voracious enemy of Aphids. The first of these has become established. True parasites introduced include *Casca* sp., and *Comperiella bifasciata*, How., both internal parasites of *Chrysompalus aurantii*. *Anysis saissetiae*, Ashm., a parasite of the black scale [*Saissetia oleae*, Bern.], introduced from China, has become established. *Coccophagus modestus*, Silv., and *C. trifasciatus*, Comp., have at last been recovered breeding under natural conditions in California, and *Exochomus flavipes*, Thunb., a scale feeder from South Africa is also apparently permanently established. *Tortrix citrana*, Fern. (orange tortrix), which particularly attacks Valencia oranges, causing the fruit to drop, has been less abundant during the last two seasons, owing to the work of parasites, of which the chief is the native Braconid, *Apanteles aristoteliae*, Vier.

Studies of the mealy plum aphis [*Hyalopterus arundinis*, F.] indicate that hibernation does not usually occur in the egg stage on prunes and plums, but that migration takes place from tules and reed grasses to orchards in the spring and back again in autumn. Soap sprays when thoroughly applied have proved the best remedy. Paradichlorobenzene as a soil fumigant has proved effective against soil-infesting pests of deciduous fruit trees, but paradichlorobenzene, calcium cyanide, potassium xanthate and carbon bisulphide failed to control *Scutigerella immaculata*, Newp. (garden centipede) in asparagus fields, though flooding was effective in one district. The sugar-beet armyworm [*Laphygma exigua*, Hb.] was controlled in fields of young cotton by drilling in the rows standard sweetened and poisoned bran mash. Sugar beet has recently suffered largely from curly-leaf. The beet leafhopper [*Eutettix tenella*, Baker] was bred from horseradish, radish, turnip and parsley. A natural breeding-ground occurs in one mountain valley, but there is no evidence to show that the insects migrate from it into the Sacramento valley.

QUAYLE (H. J.). **The Codling Moth in Walnuts.**—*California Agric. Expt. Sta.*, Bull. 402, 33 pp., 11 figs., 4 refs. Berkeley, Cal., April 1926.

This bulletin contains the results of observations and experiments extending over seven years on *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) as a pest of walnuts (*Juglans regia*); the bulk of the information given has been noticed from other sources [*R.A.E.*, A, viii, 238; x, 136, 512; xi, 9]. Although *C. pomonella* seems to prefer apple, which was undoubtedly its original food-plant, to walnut, the author does not consider that there would be any advantage either in removing apple trees from the neighbourhood of walnuts or in planting them among them, as has been suggested.

In parts of Southern California there are two broods and a partial third, but occasionally larvae of the first brood hibernate, pupating in the following spring, as is the case with the majority of the larvae of the second brood. Further north, where the mean monthly summer temperature is about 3° F. lower, there is only one complete generation and a partial second. There is some variation in the susceptibility of walnuts to attack by *C. pomonella*; the suture in the shell of the soft-shelled varieties is usually more firmly closed than it is in the hard-shelled ones, and as it is chiefly by the suture that the larvae enter the nuts in July, they are more likely to remain in the husk and not penetrate into the nut in the former.

C. pomonella has been found in apricots, and on one occasion was responsible for a considerable infestation of oranges near a walnut drying-house.

Various parasites and predators attack *C. pomonella*, including an egg parasite, *Trichogramma minutum*, Riley, and a parasite of the pupa, *Aenoplex carpocapsae*, Cushm. The parasites are being studied further, but appear not to be of much importance.

The control of *C. pomonella* on walnuts is more satisfactorily effected by spraying than by dusting, and this method costs very little more. Walnut leaves are very susceptible to injury by arsenicals, and to avoid this, basic lead arsenate should be used at the rate of 5 lb. (powder) to 100 U.S. gals. water, or for dusting, 15 per cent. lead arsenate and 85 per cent. carrier (kaolin or hydrated lime), from 6 to 10 lb. being sufficient for one tree.

For the control of *Chromaphis juglandicola*, Kalt. (walnut aphis) ½ to ¾ pint 40 per cent. nicotine sulphate should be added to every 200 gals. lead arsenate spray, or 1 to 2 lb. 40 per cent. nicotine sulphate and 15 lb. lead arsenate should be used in every 100 lb. of dust mixture ; the best time for measures against both *C. juglandicola* and *C. pomonella* is from the last week in May to the third week in June.

Lepidopterous larvae sometimes found in walnuts that might be mistaken for *C. pomonella* are *Tortrix* (*Archips*) *argyrospila*, Wlk. (fruit-tree leaf-roller), and *Plodia interpunctella*, Hb. (Indian-meal moth). The larva of *T. argyrospila* occasionally bores into growing walnuts in the same way as that of *C. pomonella*, but has not yet occurred in sufficient numbers to necessitate control measures. *P. interpunctella* frequently attacks stored walnuts ; the larvae may be destroyed by heating the nuts to 130–140° F. for one hour, or by fumigating with carbon bisulphide.

PICKETT (W. F.) & WILLIAMS (L. C.). **Spraying Fruit Plants.**—*Kansas Agric. Expt. Sta.*, Circ. 125, 15 pp., 3 figs. Manhattan, Kans., March 1926. [Recd. June 1926.]

Fruit-tree spray schedules suitable for Kansas conditions are given, with brief notes on certain insect pests and fungous diseases of fruit and the insecticides and fungicides recommended.

YOUNG (H. C.), HOUSER (J. S.) & BALLOU (F. H.). **Spraying Program for the Orchard and Fruit Garden.**—*Ohio Agric. Expt. Sta.*, Bull. 393, pp. 1–26, 2 figs. Wooster, Ohio, March 1926. [Recd. June 1926.]

The recommendations in this bulletin are such as to enable time and materials to be saved by indicating the best time for applying the various remedies to obtain the maximum effect, where possible against more than one pest, with the minimum danger of injury to foliage. Seasonal and environmental conditions affect both pests and diseases and spray injury, and recently more damage has been caused by the latter than would probably have resulted from the former in some orchards.

The preparation of various sprays and their application is discussed, and the use of the Baumé hydrometer explained. Spray schedules are given for various fruits with notes on paradichlorobenzene for the control of the peach borer [*Aegeria exitiosa*, Say].

WEIGEL (C. A.). **Calcium Cyanide as a Fumigant for Ornamental Greenhouse Plants.**—*U.S. Dept. Agric.*, Dept. Circ. 380, 16 pp., 9 figs., 3 tables, 1 ref. Washington, D.C., April 1926.

A detailed description is given of the preparation of different types of greenhouses for fumigation with calcium cyanide. No definite recommendations are made for the dosage to be used, as this will vary according to the structure of the house, type of plant and the pest to be controlled, but a table is given showing the effect of certain dosages on various insect pests at various lengths of exposure [*cf.* *R.A.E.*, A, xiii, 247], also one showing the effect of calcium cyanide on various plants in greenhouses and fumigation boxes. The construction of the latter is discussed.

McINDOO (N.E.) & DEMUTH (G. S.). **Effects on Honeybees of Spraying Fruit Trees with Arsenicals.**—*U.S. Dept. Agric.*, Dept. Bull. 1364, 32 pp., 15 refs. Washington, D.C., May 1926.

As a result of experiments extending from 1914 to 1917, it has been found that spraying fruit trees in full bloom with arsenicals is decidedly injurious to bees. The usual time for spraying is after most of the petals have fallen, in which case the bees are apparently not injured, as the daily weight records and counts of dead bees in the traps showed that they died more rapidly before than after the trees were sprayed. A chemical analysis of samples of dead bees after spraying at the usual time was begun did not indicate that they had died of arsenical poisoning, whereas the examination of dead bees when the trees were sprayed in full bloom showed decided traces of arsenic.

The fatal dose of pure arsenic per bee is about 0·0004 or 0·0005 milligram.

CHITTENDEN (F. H.). **The Common Cabbage Worm and its Control.**—*U.S. Dept. Agric.*, Farmers' Bull. 1461, 13 pp., 12 figs. Washington, D.C., May 1926.

Pieris rapae, L. (common cabbage worm) is the most important insect pest of cabbage in the United States, where it is almost universally distributed ; it was introduced from Europe, and was first recorded in Canada (Quebec) in 1860, and in Maine in 1865. Its life-history is briefly described : there are three generations a year in the northern United States and five or six further south ; the larvae attack all kinds of cruciferous crops, but are particularly injurious to cabbage and cauliflower.

Two European Hymenopterous parasites of *P. rapae*, *Apanteles glomeratus*, L., which was introduced in 1883, and *Pteromalus puparum*, L., which was probably introduced with its host, as it was first found in the United States in 1869, are of considerable value, the latter particularly in the northern States. *Polistes metricus*, Say, and *P. pallipes*, Lep., are predacious on the larvae of *P. rapae*, and frequently destroy large numbers. A bug, *Phymata wolffi*, Stål, attacks the adults when they visit flowers for nectar. Other natural enemies of *P. rapae* in the United States include *Arilus cristatus*, L. (wheel bug), *Podisus maculiventris*, Say (armed soldier bug), *Sarcophaga latisterna*, Parker, and the Tachinids, *Exorista vulgaris*, Fall., and *Frontina archippivora*, Will. In some seasons the larvae are destroyed in large numbers by a contagious bacterial disease, caused by *Micrococcus pieridis*, although they are not usually very susceptible to it. The larvae and pupae are attacked by various birds.

Arsenicals are the most effective insecticides for use against *P. rapae* and may be applied either as sprays or dusts ; there is no danger in using them up to the time that the heads are nearly formed on cabbage, or up to the appearance of heads or " sprouts " on cauliflower or Brussels sprouts ; they should not be applied after the seedling stage to plants of which the leaves are used as food. The formulae recommended are for sprays, 2 lb. lead arsenate (powder) or 1½ lb. calcium arsenate (powder) or 1 lb. Paris green and 2 lb. soap to 50 U.S. gals. water or Bordeaux mixture ; for dusts, 1 lb. lead or calcium arsenate and 5 lb. hydrated lime, or 1 lb. Paris green and 15 lb. hydrated lime ; the dusts should be applied at the rate of about 30 to 40 lb. per acre.

DUDLEY, Jr. (J. E.). **The Potato Leafhopper and how to Control it.**—*U.S. Dept. Agric.*, Farmers' Bull. 1462, 12 pp., 10 figs. Washington, D.C., May 1926.

This is a revised bulletin on the life-history and control of *Empoasca fabae*, Harr. (*mali*, LeB.), and contains instructions for the preparation of Bordeaux mixture.

SNYDER (T. E.). **Preventing Damage by Termites or White Ants.**—*U.S. Dept. Agric.*, Farmers' Bull. 1472, 22 pp., 19 figs., 2 refs. Washington, D.C., April 1926. [Recd. June 1926.]

The bulk of the information contained in this bulletin has been noticed from previous ones, which it supersedes, and from other sources [*R.A.E.*, A, iv, 181 ; v, 147 ; x, 192 ; xii, 441]. The regulations for preventing termite damage to buildings [*R.A.E.*, A, xiii, 277] are designed to keep all untreated woodwork from contact with the ground, with which the subterranean termites must have communication in order to obtain moisture, and would be applicable throughout the United States, as subterranean termites (*Reticulitermes*, etc.) occur in almost every part of the country. In the south and south-west, where non-subterranean termites (*Calotermes*, *Cryptotermes*, etc.) also occur, it should be further stipulated that only woodwork treated with preservatives may be used in exterior or interior construction, unless unobtainable.

Non-subterranean termites infesting furniture can be killed by a temperature of 110–120° F. Tree trunks and branches infested by termites should be treated with a poisonous liquid, such as kerosene emulsion diluted with water containing 1 oz. sodium arsenite per U.S. gal. ; orthodichlorobenzene could probably be used in the same way ; in treating the infested parts of a tree, which are usually in the dead heartwood, the liquids should not be allowed to come in contact with the living tissue. For the protection of growing plants calcium cyanide mixed with the soil at the rate of two ounces per square yard may be used, but it should not be placed near the plants. Kerosene nicotine oleate or 5 per cent. kerosene emulsion sprayed on greenhouse staging, or, at night, on potted plants, effectively control termites ; potted plants so treated should be thoroughly sprayed with water the following morning.

Deep ploughing in late autumn and, where practicable, irrigation, are useful for controlling termites attacking field crops ; stubble should be burnt, not ploughed in, and artificial fertilisers are preferable to animal manure, where subterranean termites are common. Where termite damage is serious, the soil should be treated with sodium arsenite or sodium cyanide before crops are planted in it.

BRITTON (W. E.). **A new Pest of Lawns.**—*Connecticut Agric. Expt. Sta.*, Bull. Immed. Informn. 52, pp. xxv–xxviii, 3 figs. New Haven, Conn., 15th December 1925. [Recd. July 1926.]

Lawns in certain localities in New Haven have been badly damaged by the grubs of *Anomala orientalis*, Waterh., which eat the roots of the grass, causing dead and brown patches. The pest is not known to occur in the United States outside one small area in New Haven. The adults emerge during July, and oviposition occurs in the soil. The eggs hatch in a few days, and the young grubs feed on the roots within an inch of the surface. In late October, when about half-grown, they descend deeper into the ground, coming up again the following spring for feeding. They become full-grown in June and pupate in cells in the soil. There is one generation each year, only a certain proportion of the larvae continuing into a second season. The parasite, *Scolia manilae*, Ashm., which has successfully controlled this beetle in Hawaii, was brought into the United States as a check to the Japanese beetle [*Popillia japonica*, Newm.], but does not survive the winters in the vicinity of Philadelphia. Although the spread of *A. orientalis* is not rapid, as it is not a strong flier, there is great danger of starting new colonies from soil carried on the roots of plants, etc., and if allowed to spread southwards the beetle might become a pest of many crops. The application of calcium or sodium cyanide at the rate of 4 oz. per sq. yd., followed by thorough watering, kills the grubs, but the vegetation suffers ; carbon bisulphide emulsion, however, kills the grubs without injuring vegetation. A co-operative attempt to eradicate the insect from the small area in which it has appeared will probably be made.

RICHARDSON (C. H.). **A Physiological Study of the Growth of the Mediterranean Flour Moth** (*Ephestia kuehniella*, **Zeller**) **in Wheat Flour.**—*Jl. Agric. Res.*, xxxii, no. 10, pp. 895–929, 13 figs., 37 refs. Washington, D.C., 15th May 1926.

The work of other investigators who have made vitamin studies on insects is reviewed, and the author describes in detail a number of experiments in this connexion with *Ephestia kühniella*, Zell. (Mediterranean flour moth). The life-history of the pest is described, and it is found that the rate of growth of the larva varies with the temperature, kind of food, and possibly other factors. A great many foods are attacked ; when bred in pea-flour, the time taken for the first moth to emerge was about 100 days—an abnormally long period of growth compared with that in wheat flour. From the experiments described, it is evident that the growth rate in flour made from wheat kernels that have had the embryos removed is about the same as the rate in highly milled wheat flour ; the chief difference seems to be the greater weight of the moths that emerge from the degerminated flour ; in flour made from the entire wheat kernels growth is normal and the moths emerging are also normal. The addition of casein, which is known to be adequate for the growth of mammals, to highly milled flour did not hasten the growth of the larvae.

Apparently, either ether or chloroform remove a substance or substances from entire wheat-flour which are similar to, or identical with, vitamin A as understood in mammalian nutrition. Yolk of egg and butter contain a substance that promotes the growth of larvae of *E. kühniella* ; this is probably vitamin A. It is believed that the deficiency in flour lies partly in its low concentration of vitamin B. The quantity of vitamin B necessary for the growth of the larvae at a normal rate appears to be contained largely, but not entirely, in the embryo of the wheat kernel.

DONOVAN (W. O.). **Insect Pests and Plant Diseases.**—*Rept. Agric. Dept. Grenada 1925*, pp. 2–3. Trinidad, Imp. Dept. Agric. W. Indies, 1926.

Platyedra gossypiella, Saund. (pink bollworm), *Heliothrips rubrocinctus*, Giard (cacao thrips), *Araecerus* (*Araeocerus*) *fasciculatus*, DeG. (mace weevil), and a Nematode attacking bananas occurred during the year, but not in serious numbers at any period. A Cecidomyiid attacking *Manihot*, probably *Itonida manihot*, Felt, was prevalent throughout the island.

FOWLER (R.). **Codlin Moth Trapping Tests (Preliminary Report).**—*Jl. Dept. Agric. S. Australia*, xxix, no. 6, pp. 527–530. Adelaide, 15th January 1926. [Recd. June 1926.]

This information on the value of solutions of apple juice or of vinegar for trapping *Cydia pomonella* has been noticed from another source [*R.A.E.*, A, xiv, 363].

LEGAT (C. E.). **Forest Department. [Report for the] Year ended 31st March 1925.**—*Union S. Africa, Ann. Deptl. Repts. 1924–25*, no. 5, pp. 382–411. Pretoria, 1926.

The eucalyptus snout beetle [*Gonipterus scutellatus*] spread further during the year and became general in Natal, where it had previously only been reported from two localities ; it appeared in the Transkei district of Cape Province on *Eucalyptus globulus* and continued to cause severe damage in the Transvaal, particularly to *E. viminalis*. Barking of felled wood has had considerable effect in controlling *Phoracantha semipunctata*, but stands of unhealthy *Eucalyptus* were destroyed by it in one district. Locusts seriously damaged two- and three-year old *Eucalyptus* trees on one plantation. Plantations of *Pinus insignis* in the Cape Province were attacked by a defoliating caterpillar that has not yet been identified. Young wattle trees

[*Acacia*] in the Transkei district were defoliated by a beetle, *Monochelus calcaratus*. *Chaliodes junodi* (bagworm) was less prevalent on wattle in Natal than in previous years.

Entomological Section.—*Minist. Agric. Egypt, Cotton Res. Bd., 4th Ann. Rept. 1923*, pp. 51–56. Cairo, 1926.

As in previous years [*R.A.E.*, A, xii, 282] regular examinations of green cotton bolls were carried out in each province throughout the season in order to estimate the percentage attacked by bollworms [*Platyedra gossypiella*, Saund., and *Earias insulana*, Boisd.]; to facilitate comparisons with future years the examinations were carried out on the 5th, 15th, and 25th of each month from 25th June to 5th October, instead of at intervals of one week; the results are tabulated.

In 23,050 samples of cotton seed treated against *P. gossypiella* in hot air machines only 196 contained living larvae; during the year all machines were fitted with an automatic heat regulating and recording instrument, the value of which is being investigated.

Adults of *P. gossypiella* have been found capable of living for fifty days under laboratory conditions in the spring; this fact is of importance in connection with individuals that emerge in the spring before the cotton plants are bearing bolls. A number of cotton-sticks bearing bolls were spread over the roof of a building near Cairo during the winter, and some of the bolls were examined each month for the presence of living larvae of *P. gossypiella*; the number of living larvae per hundred bolls and the estimated number of living larvae in the cotton-sticks from 1 feddân (1·038 acre) in each month from January to August are tabulated. The number of living larvae per hundred bolls decreased from 38 in January to 2 in August.

The results of other investigations briefly discussed in this report have been noticed elsewhere [*R.A.E.*, A, xiii, 278, 280, 422].

DEL CAÑIZO (J.) & SARDIÑA (J. R.). **Sobre los nematodos parásitos de la remolacha.** [On the Nematodes parasitic on Beet.]—*Bol. Estac. Pat. veg.*, i, no. 2, pp. 48–52, 3 figs. Madrid, April 1926. [Recd. July 1926.]

The Nematodes infesting beet in Spain are *Heterodera radicicola*, Greef, and *H. schachtii*, Schm. Colza or rape may be sown in summer as trap-crops; these are uprooted and either burnt or buried with quicklime. This procedure should be carried out three times during the summer. The use of calcium cyanide is also recommended, the material being placed in furrows as they are made with a plough so that it is covered when the plough opens the next furrow. This may be combined with the trap-crop planted in rows about 2 ft. apart. One means of spread of *H. schachtii* is in the use of the waste water from sugar-beet factories.

HERCE (P.). **Un nuevo parásito del olivo** (*Lepidosaphes destefanii*, **Leon.**). [A new Pest of the Olive.]—*Bol. Estac. Pat. veg.*, i, no. 2, pp. 53–54, 3 figs. Madrid, April 1926. [Recd. July 1926.]

Olive twigs from Saragossa were found to be infested with *Lepidosaphes destefanii*, Leon., a Coccid originally described from *Phillyrea media* in Sicily, and not previously recorded in Spain, or on olives.

BENLLOCH (M.). **Experiencias sobre el empleo del cianuro de calcio en la fumigación de los olivos para combatir la plaga de *Phloeothrips oleae*, Costa.** [Experiments on the Use of Calcium Cyanide in the Fumigation of Olives against *P. oleae*.]—*Bol. Estac. Pat. veg.*, i, no. 2, pp. 55–64, 4 figs. Madrid, April 1926. [Recd. July 1926.]

In these experiments Cyanogas calcium cyanide " A " dust [*R.A.E.*, A, xiv, 74] was used under tents against *Phloeothrips oleae*, Costa, infesting olive trees in Spain. A table is given for 19 trees of varying sizes, showing the amount of fumigant used, and the temperature, moisture, time of application and number of insects observed. At temperatures between 8° C. [46·4° F.], or better, 10° C. [50° F.] and 25° C. [77° F.] the results were satisfactory and compared favourably with those obtained with sodium cyanide and sulphuric acid, practically all the thrips being killed. The fumigant should not be applied, however, at a humidity of 35 per cent. or lower, or if the foliage, tent or ground are wet. The dust must be well distributed within the tent, a special apparatus being available for measuring and applying it.

BERRO (J. M.). **Resultados de algunas experiencias para la destrucción por el frío de la *Ceratitis capitata* Wied.** [The Results of some Experiments for the Destruction by Cold of *C. capitata*.]—*Bol. Estac. Pat. veg.*, i, no. 2, pp. 64–66. Madrid, April 1926. [Recd. July 1926.]

As a result of the prohibition on the import into the United States of Almeria grapes from Spain, owing to the danger of infestation by *Ceratitis capitata*, Wied. [*R.A.E.*, A, xii, 123], experiments were carried out on the effect of cold storage on this fruit-fly. They were based on a period of 14 days, this being the average time for the Atlantic crossing during which such treatment could be applied in the ship's cold storage chambers. An average temperature of 2·1° C. [35·78° F.] maintained for 14 days and never rising above 3·5° C. [38·3° F.] destroyed all pupae in earth in tubes. At a temperature of −1·5° C. [29·3° F.] with a maximum of 0° C. [32° F.] all eggs and larvae were destroyed, even in grapes packed, as they are for export, in cork dust in barrels. No injury results to the grapes for 30–45 days after they are removed from cold storage, but after that period they deteriorate more rapidly than those that have been kept at a normal temperature.

BENLLOCH (M.). **Tratamientos de primavera contra el " arañuelo " o " polilla " del manzano (*Hyponomeuta malinellus*, Z.).** [Spring Treatment against the Apple Moth, *H. malinellus*.]—*Bol. Estac. Pat. veg.*, i, no. 2, pp. 70–71, 2 figs. Madrid, April 1926. [Recd. July 1926.]

A lead arsenate spray is the best means of controlling *Hyponomeuta malinellus*, Zell., on apples. One or two applications should be made when the larvae that have hibernated begin feeding on the tender leaves. The spray may be prepared from the following formula: Anhydrous sodium arsenate, 2 lb. (or sodium arsenate crystals, 4 lb.), powdered lead acetate, 6 lb., recently slaked lime, 5 lb., and water to make 100 gals.

Gautier (C.) & Russo (G.). **Sopra un *Ecphylus* parassita del *Chaetoptelius vestitus* (Muls.-Rey) Fuchs.** [On an *Ecphylus* parasitising *Hylesinus vestitus*.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xviii, pp. 150–158, 2 figs. Portici, 1925. [Recd. July 1926.]

The Braconid, *Ecphylus chaetoptelii*, sp. n., is a parasite of the Scolytid, *Hylesinus* (*Chaetoptelius*) *vestitus*, Muls. & Rey., the adult of which injures the buds of pistachio (*Pistacia vera*) in Sicily.

Bezzi (M.). **I generi *Gastrozona* e *Taeniostola* (Dipt. : Trypaneidae) ed una specie dannosa ai Bambù nell' Estremo Oriente.** [The Genera *Gastrozona* and *Taeniostola* and a Species injurious to Bamboos in the Far East.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xviii, pp. 258–267, 21 refs. Portici, 1926.

The Trypetid, *Gastrozona macquarti*, Hend., is recorded as seriously infesting the shoots of *Bambusa stenostachys* in Formosa.

Wolff (M.) & Krausse (A.). **Frühdiagnose und Kontrolle von Frasskalamitäten im Walde sowie Vorsichtsmassregeln beim Arsenbeflug.** [The early Diagnosis and Watching of Outbreaks in Forests and the Precautionary Measures needed when dusting from Aeroplanes.]—*Forstl. Flugblätter, Minist. Landw. Domänen u. Forsten*, no. 7, 4 pp., 1 fig. Neudamm, 1926.

The excreta of caterpillars attacking forest trees provide a means for gauging the infestation. Sheets of waterproof paper are used for collecting this material, which is then measured in graduated glasses. It is suggested that the surface unit should be 1 square metre. Attention is drawn to the precautions to be taken when dusting arsenicals from aeroplanes.

Wolff (M.) & Krausse (A.). **Die Kiefernnadelscheidegallmücke (*Thecodiplosis brachyntera* Schwaegrichen).** [The Pine Needle Sheath Gall Midge, *T. brachyntera*.]—*Forstl. Flugblätter, Minist. Landw. Domänen u. Forsten*, no. 8, 2 pp., 3 figs. Neudamm, 1926.

The damage due to the pine gall-midge, *Thecodiplosis brachyntera*, Schwaegr., is often overlooked. It causes infested needles to turn yellow and wither, most of them falling in autumn, so that entire stands of pines may be stripped. The only measures that seem feasible are such as promote the healthy growth of the pines.

Stellwaag (F.). **Neuzeitliche Schädlingsbekämpfung im Obst- und Gemüsebau.** [Modern Pest Control in Fruit and Vegetable Cultivation.]—8vo, viii + 118 pp., 38 figs. Wiesbaden, R. Bechtold & Co., 2nd edn., 1926.

This second edition [*cf.* *R.A.E.*, A, x, 518] has been improved by a revision of the text and by the substitution of better illustrations in many cases.

STELLWAAG (F.). **Der Gebrauch der Arsenmittel im deutschen Pflanzenschutz. Ein Rückblick und Ausblick unter Verwertung der ausländischen Erfahrungen.** [The Use of Arsenicals in German Plant Protection. A Retrospect and Prospect with the Help of the Experience attained in other Countries.]—*Zeitschr. angew. Ent.*, xii, no. 1, pp. 1–50 ; also *Flugschr. Deutschen Ges. angew. Ent.*, no. 11, 50 pp. Berlin, 1926.

The chief arsenicals used in Germany are copper aceto-arsenite (Paris green), calcium arsenate and lead arsenate, the first being the most generally employed. Research on these poisons is necessary, for it is possible that certain arsenicals may act differently in an alkaline medium (insect gut) and in an acid one (mammalian stomach) and might result in the production of insect poisons harmless to man.

EIDMANN (H.). **Der Kiefernspanner in Bayern im Jahre 1925 mit besonderer Berücksichtigung des Parasitenproblems.** [The Pine Geometrid in Bavaria in 1925, with particular Regard to the Problem of Parasites.]—*Zeitschr. angew. Ent.*, xii, no. 1, pp. 51–90, 15 figs., 23 refs. Berlin, 1926.

During an outbreak in 1925 of the pine moth, *Bupalus piniarius*, L., in many parts of Bavaria, over 50,000 pupae were examined individually. Predacious insects and vertebrates are of little use once an outbreak has occurred, though their preventive value is considerable. Pigs will destroy large numbers of pupae in the forest litter, and the collection of it into large heaps is very successful owing to the fermentation thus produced killing many of the pupae and preventing the escape of the moths.

Hymenoptera were the most important parasites. Of 3,378 Ichneumonids bred out, 87·2 per cent. were *Ichneumon nigritarius*, Grav. This species appears about 8 weeks before the moth, oviposition occurring soon after emergence and lasting over a long period. The pupae of the moth are not parasitised. *I. nigritarius* appears to have two generations a year and requires a change of host, one of these being *Hematurga atomaria*, L., which has five parasites in common with *B. piniarius*, and the presence of which in numbers in a forest therefore provides an excellent parasite reservoir. The most important Tachinid parasites are *Carcelia rutilla*, B.B., and *Lydella nigripes*, Fall. Both hibernate as larvae in the pupae of *B. piniarius*, emerging in spring in order to pupate in the ground. *L. nigripes* was also obtained from *H. atomaria*. In view of the polyphagous character of the parasites of this moth a return to mixed forest stands and the encouragement of a varied small flora are recommended to prevent outbreaks of it.

BODENHEIMER (F. S.). **Ueber die Voraussage der Generationenzahl von Insekten. III. Die Bedeutung des Klimas für die landwirtschaftliche Entomologie.** [On the Prediction of the Number of the Generations in Insects. III. The Significance of Climate for Agricultural Entomology.]—*Zeitschr. angew. Ent.*, xii, no. 1, pp. 91–122, 7 charts, 58 refs. Berlin, 1926.

This further discussion of this subject [*cf. R.A.E.*, A, xiii, 389 ; B, xiii, 33] deals with climate as a factor in limiting insect life. Pierce's work on the relationships of temperature and humidity to insect development [A, iv, 233] is discussed (together with similar work by others) as a basis for the preparation of data on the viability of various insects in a given locality and at a given season.

The second part of the paper deals with rapidity of development in relation to climate, the results obtained by various workers being noticed. A hyperbolic curve is given for *Sitotroga cerealella*, and data of temperatures for 25 species of economic importance are compiled from the literature. Although the equilateral hyperbola is not the exact curve corresponding to the actual development in relation to temperature, life-histories calculated according to Blunck's formula [A, xiii, 389] give practical results.

ZWEIGELT (F.). **Zur Periodizität des Maikäfers. Ein Vorwort.** [On the Periodicity of the May Beetle. A preliminary Note.]—*Zeitschr. angew. Ent.*, xii, no. 1, pp. 123–137. Berlin, 1926.

This paper discusses and disputes the views on *Melolontha* advanced by Kozikowski and by Schmidt [*R.A.E.*, A, xiii, 214, 438]. *M. hippocastani* may sometimes have a three-year development cycle.

[MEĬER (N. F.).] MEYER (N. F.). **Biologie von** *Angitia fenestralis* **Holmgr. (Hymenoptera, Ichneumonidae), des Parasiten von** *Plutella maculipennis* **Curt., und einige Worte über Immunität der Insekten.** [The Biology of *A. fenestralis*, the Parasite of *P. maculipennis*, and some Notes on Immunity in Insects.]—*Zeitschr. angew. Ent.*, xii, no. 1, pp. 139–152, 10 figs., 14 refs. Berlin, 1926.

A briefer account of these observations has already been noticed [*R.A.E.*, A, xiii, 543]. Besides *Angitia fenestralis*, Holmgr., a number of other parasites, which are, however, of comparatively small importance, attack *Plutella maculipennis*, Curt., viz., *Phygadeuon rusticellae*, Bridgm., *Phaeogenes plutellae*, Kurd., *Apanteles plutellae*, Kurd., and *Angitia armillata*, Grav.

DINGLER (M.). **Rüsselkäferstudien. II. Neue Beiträge zur Generation des** *Hylobius abietis* **L.** [Studies on Weevils. II. New Contributions regarding the Generations of *H. abietis*.]—*Zeitschr. angew. Ent.*, xii, no. 1, pp. 153–161, 1 pl. Berlin, 1926.

The observations recorded in detail here were made in 1924 and confirm the findings given in the preceding paper on the number of annual generations of *Hylobius abietis*, L. [*R.A.E.*, A, xiii, 63, 201].

PRELL (H.). **Beiträge zur Kenntnis einer Amöbenseuche der Honigbiene.** [Contributions to the Knowledge of an Amoebic Disease of the Honey Bee.]—*Zeitschr. angew. Ent.*, xii, no. 1, pp. 163–168, 9 refs. Berlin, 1926.

An amoeba, *Vahlkampfia* (*Malpighamoeba*) *mellificae*, sp. n., is described from the Malpighian tubes of the honey bee. It gives rise to sudden outbreaks of disease in bees.

Kovačević (Ž.). **Šumski požari i potkornjaci.** [Forest Fires and Bark-beetles.]—*Šumarski List*, xlviii, pp. 21–22. Zagreb (Agram), 1924. (Abstract in *Zeitschr. angew. Ent.*, xii, no. 1, pp. 185–186. Berlin, 1926.)

In Croatia bark-beetles appeared in 1921 and 1922 where fires had occurred in forests of spruce and beech, trees injured at the foot of the trunk being especially infested. The infestation was favoured by the presence of unbarked stumps and windfalls. The practice of ringing standing trees in order to obtain firewood also provides abundant breeding-places. The species found on beech were *Cryphalus* (*Ernoporus*) *tiliae*, Panz., *C.* (*E.*) *fagi*, F., *Xyloterus domesticus*, L., and *X. signatus*, F. Those on spruce were *X. lineatus*, Oliv., *Polygraphus poligraphus*, L., *P. subopacus*, Thoms., *Hylastes cunicularius*, Er., *Ips typographus*, L., *I.* (*Orthotomicus*) *laricis*, F., *I.* (*O.*) *suturalis*, Gyll., and *I.* (*Pityogenes*) *chalcographus*, L.

Sarnavka (R.). *Galerucella luteola* (**Müll.**).—*Šumarski List*, xlviii, pp. 628–638. Zagreb (Agram), 1924. (Abstract in *Zeitschr. angew. Ent.*, xii, no. 1, pp. 194–196. Berlin, 1926.)

In Bosnia the elm leaf-beetle, *Galerucella luteola*, Müll., mines the young leaves of *Ulmus montana* in spring. Oviposition begins between the end of April and the end of May according to the locality and lasts about two months. The eggs are laid in rows of 10–30 on the undersides of leaves on the warmer south or south-eastern sides of elms and hatch in about 15 days. The larvae feed for about six weeks and then descend to the ground to pupate. By banding the trunks with moss covered with sacking, large numbers were collected that had prepared to pupate under the banding. The pupal stage lasts about two weeks. This beetle appears to have only one generation a year in Bosnia and to hibernate as an adult.

Ebert (—). **Der erste Flugzeug-Grosskampf gegen die Nonne.** [The first Aeroplane Campaign against the Nun Moth.]—*Der Deutsche Forstwirt*, vii, no. 76, 1925.

Ebert (—). **Endgültiges über den Nonnenkampf im Sorauer Walde.** [A final Word on the Nun Moth Campaign in the Sorau Forest.]—*Ibidem*, vii, no. 93, 1925. (Abstracts in *Zeitschr. angew. Ent.*, xii, no. 1, pp. 199–200. Berlin, 1926.)

The information given here is substantially the same as in a paper already noticed [*R.A.E.*, A, xiii, 539].

Komárek (J.). **Studie o kůrovci smrkovém** (*Ips typographus*). [A Study on *I. typographus*.]—*Lesnická práce*, 4th Year ? (With a Summary in German.) (Abstract in *Zeitschr. angew. Ent.*, xii, no. 1, p. 203. Berlin, 1926.)

In Bohemia *Ips typographus* is distinctly a mountain species on spruce, and at lower altitudes in the hilly country it is replaced by *I. cembrae*. In the North and South its distribution coincides with that of the nun moth [*Lymantria monacha*], but injury by the latter does not lead to an increase of the Scolytid because the defoliation of the tree crown rapidly dries the bark and renders it unsuitable for it.

König (—). **Die Forleule und ihr jüngster Frass.** [The Pine Moth and the latest Injury caused by it.]—*Forstw. Centralbl.*, 1925, p. 393. (Abstract in *Zeitschr. angew. Ent.*, xii, no. 1, p. 210. Berlin, 1926.)

The outbreak of the pine moth [*Panolis flammea*] in 1924 and 1925 resulted in total defoliation in 425,000 acres and partial defoliation in 800,000 acres. The fungus, *Entomophthora aulicae*, is thought to have been the main factor in bringing this outbreak to an end.

de Koning (M.). **De groene Eikenbladroller,** *Tortrix* (*Heterognomon*) *viridana* **L.** [The Green Oak Leaf-roller, *T. viridana*.]—*Tijdschr. Plantenziekten*, xxxii, no. 6, pp. 180–183. Wageningen, June 1926.

In Holland, *Tortrix viridana*, L., hibernates in the egg stage, and the larvae hatch in May when the new shoots of oak appear. Another oak leaf-roller, *Peronea* (*Acalla*) *ferrugana*, Schiff., is also injurious later in the year. *T. viridana* prefers older trees, so that nurseries and young plantations are not affected. The control of this pest must be left to its natural enemies.

Thompson (W. R.). **Recherches sur les larves des Tachinaires** *Sturmia, Winthemia, Carcelia* **et** *Exorista.*—*Ann. Parasit. hum. & comp.*, iv, nos. 2 & 3, pp. 111–125 & 207–227, 2 pls., 8 refs. Paris, 1st April & 1st July 1926.

Following on a description of the Tachinids that lay eggs on the food of the host [*R.A.E.*, A, xii, 503], the author now deals with the species belonging to other biological groups. As there is at present no certain method of placing a Tachinid in its ethological group from a study of the larval characters only, the author has discontinued an attempt at classification on biological grounds and follows that of Bezzi & Stein's catalogue. Descriptions are given of the primary larvae of 14 species belonging to the genera under discussion, with a key.

[Lebedeva (V. A.).] **Лебедева (В. А.). On the Biology of** *Theresia* (*Procris*) *ampelophaga*, **Bayle.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 4–15, 15 figs., 1 ref. Leningrad, March 1926. [Recd. July 1926.]

The seasonal history of *Theresia ampelophaga*, Bayle, occurring at Yalta (Crimea) is described [*cf. R.A.E.*, A, xiv, 227], with numerous details of its bionomics as observed in the laboratory. It is not a pest of very great importance, as it occurs mainly in neglected vineyards.

Its parasites are *Apanteles inclusus*, Ratz., which lays its eggs on the first stage larvae, and *Homoporus crassiceps*, Thoms., which parasitises the pupae, as many as 10–15 being found in one host. One individual of the Tachinid, *Tricholyga minor*, Rond., was also reared from it.

[Stark (V. N.).] **Старк (В. Н.). The Influence of Soil on the Injurious Insect Fauna of Poplar.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 15–22. Leningrad, March 1926. [Recd. July 1926.]

A list is given of 89 species of insects attacking poplar in the Bryansk forest, some of which are much more injurious in certain parts of the forest than in others. It was found that the difference in the soil was an important factor in this uneven distribution, partly as a result of the varying reaction of the tree to attack when growing on different soils, and partly because certain soils are unsuitable to some pests that pass their larval stage underground. The largest number of pests causing serious infestations occurred on sandy soil, and the smallest on clay.

[Rudnev (N. N.).] **Руднев (Н. Н.). The Time of Sowing and Transplanting Cabbages as a Factor in the Control of the Cabbage Fly** (*Phorbia* (*Hylemyia*) *brassicae*, **Bch.).** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 22–28, 7 refs. Leningrad, March 1926. [Recd. July 1926.]

The seasonal history of *Phorbia brassicae*, Bch., near Moscow is discussed.

[Klyachkin (Yu. G.).] **Клячкин (Ю. Г.). Barkbeetles of the Family Ipidae of the Tartar Republic.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 29–33. Leningrad, March 1926. [Recd. July 1926.]

This is an annotated list of the Scolytidae of the Tartar Republic, comprising 41 species.

[Firsov (P. P.).] **Фирсов (П. П.). The More Important Insect Pests of Orchards and Bush-fruits in the Gorki Region.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 33–36. Leningrad, March 1926. [Recd. July 1926.]

During the winter of 1924–25 a survey of orchards in the Gorki district was begun, the insect pests recorded in order of their economic importance being :—*Anthonomus pomorum*, L., *Psylla mali*, Forst., *Aporia crataegi*, L., *Cydia* (*Carpocapsa*) *pomonella*, L., *Hyponomeuta malinellus*, Zell., *Malacosoma neustria*, L., *Melolontha melolontha*, L. (*vulgaris*, F.), *Abraxas grossulariata*, L., *Aphis pomi*, DeG. (*mali*, F.), *Myzus* (*A.*) *cerasi*, F. *Hyalopterus arundinis*, F. (*A. pruni*, F.), *Myzus* (*A.*) *ribis*, L., *Episema* (*Diloba*) *coeruleocephala*, L., *Arctornis chrysorrhoea*, L. (*Porthesia similis*, Fuess.), *Peronea* (*Teras*) *holmiana*, L. (pear leaf roller), *Neurotoma* (*Lyda*) *flaviventris* var. *pyri*, Schr. (pear sawfly), and *Byctiscus betulae*, L. (*Rhynchites betuleti*, F.).

[Shchegolev (V. N.).] **Щеголев (В. Н.). Experiments for the Control of Tenebrionids injurious to Cereals.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 36–38. Leningrad, March 1926. [Recd. July 1926.]

The information contained in this paper has already been noticed from another source [*R.A.E.*, A, xiv, 212].

[MEĬER (N. F.).] **Мейер (Н. Ф.). Keys for the Determination of the Genera of the Family Ichneumonidae. (Part 1: Subfamilies Ichneumoninae, Cryptinae and Pimplinae.)** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 43–56. Leningrad, March 1926. [Recd. July 1926.]

These keys include the European genera as well as those occurring in Asiatic Russia.

[LEBEDEV (F. N.).] **Лебедев (Ф. Н.). Autumn Ploughing as a Means of controlling Locusts.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 93–95. Leningrad, March 1926. [Recd. July 1926.]

Though autumn ploughing has frequently been recommended for the control of locusts, it is not dependable, as is shown by the experiments here described, The eggs of the Asiatic locust [*Locusta migratoria*, L.], even when exposed to a frost of − 30° R. [− 35·5° F.], emerged normally when brought into the warm temperature of the laboratory in the spring. Even the young locusts that had been exposed to freezing in cages for 24 hours thawed when brought into the laboratory and seemed to be unharmed. Besides not having the desired effect on the locusts, ploughing in the autumn is likely to destroy a large number of parasites; it is therefore recommended that chemical measures should be adopted in the spring rather than autumn ploughing. In these experiments locusts were found to emerge from a depth of over 5 inches provided that the top layer of the soil was not too hard for them to penetrate.

[PARFENT'EV (I. A.).] **Парфентьев (И. А.). On the Variation in Toxicity of Calcium Arsenate in the Presence of Lime.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 95–97. Leningrad, March 1926. [Recd. July 1926.]

As a result of the experiments here described it was found that lime, which is frequently recommended for use with calcium arsenate dusts, distinctly reduces the toxicity of the poison. Cockroaches fed on small particles of bread containing 2·5 per cent. calcium arsenate ($CaHAsO_4$) all died between the second and fourth day, and examination showed them to contain an average of 0·3—0·5 mgm. of arsenic pentoxide. Cockroaches fed on the same bait with the addition of lime $(CaOH)_2$ were able to withstand the poison, though when examined they contained as much as 3 mgm. of arsenic pentoxide. It would appear that the lime prevents hydrolysation of the calcium arsenate in the gut of the insect, a reaction that is essential for assimilation of the salt.

Other materials may have a different effect on the poison, thus though some cockroaches were not killed with a bait containing 1 per cent. of calcium arsenate, all were killed when 5 per cent. of sulphur was added to the mixture. A bait containing 6 per cent. of sulphur alone had no effect on the insects.

[KONAKOV (N.).] **Конаков (Н.). Migration of *Pieris daplidice*, L.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, p. 101. Leningrad, March 1926. [Recd. July 1926.]

From 18th–20th July *Pieris daplidice*, L., was seen in Voronezh flying in very large numbers in separate swarms along a front of over

16½ miles. All the swarms were flying in a direction from east to west at about 3 ft. from the ground. When met by a strip of forest land they rose above it, without altering the direction of their flight.

TILLYARD (R. J.). **The Progress of Economic Entomology in Australia and New Zealand.**—*N.Z. Jl. Agric.*, xxxii, nos. 3 & 4, pp. 173–181 & 236–242. Wellington, 20th March & 20th April 1926.

In the first part of this paper the author discusses the various introductions of natural enemies of injurious insects into New Zealand that have been attempted in recent years. The introduction of *Aphelinus mali*, Hald., for the control of the woolly apple aphis [*Eriosoma lanigerum*, Hausm.] and its establishment in New Zealand and distribution thence to other countries have been noticed previously [*R.A.E.*, A, ix, 534; xiii, 18; etc.]. The Coccinellid, *Hippodamia convergens*, Guér., which is a most important natural enemy of *E. lanigerum* in California, was introduced at the same time as *A. mali*, and thousands were liberated at various places in the Nelson Province, but none has since been seen; it is probable that its habit of seeking the tops of high mountains for hibernation is the cause of its failure to establish itself.

Some years ago *Novius cardinalis*, Muls., was introduced to control the cottony cushion scale [*Icerya purchasi*, Mask.], which it almost exterminated, with the result that it disappeared itself; on gorse [*Ulex europaeus*], however, the scale maintained its existence [*cf.* *R.A.E.*, A, viii, 121], and has now spread again to other plants. The Australian Coccinellid, *Cryptolaemus montrouzieri*, Muls., introduced to control mealy-bugs [*Pseudococcus* spp.] in orchards [*R.A.E.*, A, xii, 272], does not appear early enough in the season, under natural conditions, to be effective; by rearing the beetles in warm insectaria it is possible to distribute them in time to check the pest where it threatens to become serious, and this has been done both in New Zealand and California.

In introducing the Chalcid, *Habrolepis dalmanni*, Westw., for the control of *Asterolecanium variolosum*, Ratz. (oak scale), an unexpected difficulty was encountered; in 428 adults bred from imported material there was only a single male. It appears probable that unfertilised females of this species produce only males and fertilised ones only or mostly females, and this may render the establishment of the parasite very difficult. A similar difficulty has arisen in connection with the importation of *Perilissus luteolator*, Grav., a parasite of *Caliroa limacina*, Retz. (pear slug). A consignment of cocoons of *C. limacina* was received from England, from which no insects emerged in the spring of 1923, but in the spring of 1924 about 40 *P. luteolator*, of both sexes, and a number of *C. limacina* emerged. The parasites were liberated where there was a plentiful supply of larvae of the host, some in the open and some in an insectarium, and deposited eggs in them, but only males of *P. luteolator* were produced in 1925.

In an attempt to introduce, through the Imperial Bureau of Entomology, two Tachinid parasites of *Forficula auricularia*, L. (earwig), *Digonochaeta setipennis*, Fall., and *Rhacodineura antiqua*, Mg., puparia of *D. setipennis* and living earwigs parasitised by *R. antiqua* were sent to New Zealand, and the Tachinids were bred for two generations, but did not maintain a sufficiently high percentage of parasitism for the experiments to be continued. *D. setipennis* is larviparous, and the larvae are deposited in the haunts of the earwigs into which they penetrate; they feed inside the host, finally killing it, and then emerge to pupate. The minute eggs of *R. antiqua* are laid on the food of the earwigs, and are swallowed by them; the subsequent development of the parasite is similar to that of *D. setipennis*. Earwigs fed on potato on which eggs of *R. antiqua* had been laid ate the potato, but avoided the eggs; eggs laid on dandelion leaves were, however, swallowed with the food.

Experiments in trapping *Cydia* (*Laspeyresia*) *pomonella*, L. (codling moth) with apple juice, a method devised in Colorado and recently tested in South Australia [*R.A.E.*, A, xiii, 125; xiv, 363], have been made near Nelson. The author considers that this line of control should be further investigated, especially in view of the recent objections to the sale in Great Britain of apples that have been sprayed with arsenicals.

The second part of this paper, devoted to a discussion of the control of noxious weeds by means of insects, is mainly taken up by a description of the work of controlling prickly-pear (*Opuntia*) by this method in Australia. In this work, before any insect is liberated, its ability to feed on numerous economic plants is tested; of more than thirty species of insects introduced in the course of the work not a single one has been found capable of existing on any plant other than *Opuntia*. In view of the success of this work and of the control of *Lantana* by means of its insect pests in Hawaii [*R.A.E.*, A, xiii, 20], the author considers that the method should be applied to the extermination of other noxious weeds, in particular St. John's wort (*Hypericum perforatum*) in Victoria, and blackberry [*Rubus* spp.] in Australia and New Zealand, although in the case of the latter plant it might be necessary to sacrifice cultivated raspberries and loganberries in order to be successful.

YOUNG (R. R. T.). **The Estimation of Nicotine in Tobacco.**—*N.Z. Jl. Sci. & Technol.*, viii, no. 3, pp. 129–142. Wellington, N.Z., April 1926.

Many different methods of estimating the quantity of nicotine in tobacco are reviewed, and the author suggests a modification of Keller's method, which is both accurate and simple. The experiments described seem to prove definitely that the amount of ammonia present is too small to affect appreciably the results obtained in determination of the percentage of nicotine in insecticides by this modified method.

JARVIS (E.) & MUNGOMERY (R. W.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxv, pt. 5, pp. 418–420. Brisbane, 1st May 1926.

Against *Mastotermes darwiniensis*, Frogg., in sugar-cane, such simple methods as poison baits applied to infested stumps, posts, etc., digging out nests and killing queens, and burning old logs and trees about headlands, should not be neglected. Preliminary experiments also indicate that the practice of dipping the ends of sets before planting in dehydrated tar will give good results.

In the southern districts of Queensland, wireworms have been troublesome, especially on low-lying lands under *Paspalum*. Ploughing should be done in spring and summer, and some non-susceptible crop, such as clover or field peas, should be alternated before planting with cane. The moth borer, *Phragmatiphila truncata*, Wlk., is prevalent, especially where the cane has been neglected and is overrun with weeds.

BHASIN (H. D.). **Annual Report of the Entomologist to Government, Punjab, Lyallpur, for the Year ending 30th June, 1925.**—*Rept. Dept. Agric. Punjab, 1924–25*, Part i, pp. xx-xxvii. Lahore, 1926.

Insects reported as damaging cotton during the year were *Tarache notabilis*, *Phycita infusella*, *Cosmophila erosa* and *Alcides affaber*. Moth borers in sugar-cane, maize and sorghum were *Diatraea auricilia*, *Emmalocera* sp., *Scirpophaga xanthogastrella* and *Sesamia uniformis*.

The parasites, *Bracon lefroyi*, *Elasmus* sp. and *Rhogas testaceus* were fairly common on larvae of *Earias* sp., and *Actia aegyptia*, *Melcha nursei*, *Chalcis tachardiae* and *C. rufescens* were bred from both larvae and pupae of this moth. *Bracon kitcheneri* was bred from *Antigastrella catalaunalis* and other caterpillars. *Trichogramma evanescens*, bred from the eggs of *Chilo simplex*, was successfully introduced on eggs of *Earias cupreoviridis*.

Mango hoppers [*Idiocerus* spp.] are serious pests in certain localities, but spraying with resin wash gives good results against them. Other pests recorded include a Psyllid and *Papilio demoleus* on *Citrus* and *A*[*ulacophora*] *abdominalis* on water melons.

HUSAIN (M. A.) & SHAH (S. A.). **The Red Pumpkin Beetle,** *Aulacophora abdominalis*, **Fb., and its Control; with a short Note on** *A. atripennis*, **Fb.**—*Mem. Dept. Agric. India*, Ent. Ser., ix, no. 4, pp. 31–57, 3 pls., 18 refs. Calcutta, February 1926.

Cucurbitaceous crops, which are very largely grown in the Punjab and include melons and water-melons, are very severely damaged by *Aulacophora abdominalis*, F. (red cucumber beetle). Of the fifteen species of *Aulacophora* reported as pests during recent years, *A. abdominalis*, *A. atripennis*, F., and *A. stevensi*, Baly, only have been recorded from India as pests of cucurbits and only the first two occur in Northern India. The distribution of *A. abdominalis* is discussed, and the various stages of the beetle are described. The eggs are laid, singly or in batches, on moist soil around the base of the food-plant, oviposition lasting over a month and one female having been known to lay as many as 295 eggs. Moisture and shade seem to be essential conditions for hatching, which occurs in from 6 to 15 days, the young grubs immediately boring into roots, stems and fruits and later feeding on leaves lying on the ground. There are 4 instars, the larvae entering the ground each time to moult, the larval stage lasting from 13 to 23 days. When mature, the larva enters the soil and, at any depth from half to 10 inches, constructs an oval waterproof cocoon. The pupal stage lasts from 7 to 17 days.

There are 5 generations in a year; the adults, after hibernation, begin to appear about the end of April, and thereafter the generations overlap considerably, all stages being met with until October; the hibernating beetles probably belong to 3 or even 4 different generations. Hibernation occurs under old Cucurbitaceous creepers, among grasses or weeds, or in the soil. The mortality is very high during hibernation, exposure to cold causing many deaths. Those individuals that survive cause the greatest damage, as they emerge just as the spring crop of cucurbits is appearing, and these they defoliate to such an extent that sometimes the crop has to be re-sown 3 or 4 times.

The most effective measures are those directed against the emerging beetles in the spring. Ashes, slaked lime or road dust, mixed with tobacco dust or kerosene are often used as repellents, but poison dusts give better results. The best was Paris green with ashes or road dust, in the proportion 1 : 8 parts by weight. Paris green 1 : 32 or lead arsenate 1 : 30 also gave good control. Sprays recommended are 1 part (weight) lead arsenate with 3 parts lime and 6 parts molasses to 600 parts water; or a tobacco decoction made of 6 parts tobacco refuse and 1½ parts soap to 600 parts water. Either spraying or dusting should be repeated every 5th or 6th day to keep the new leaves covered. A few plants might be sown early and heavily dusted to serve as a trap crop, and collection by hand or with nets, or shaking the insects from the plants into pans containing water and kerosene, will reduce the numbers considerably. Ploughing and harrowing the fields after the spring crop is harvested exposes and kills many pupae and larvae. Clean cultivation is essential, and collecting creepers in November and keeping them until most of the hibernating beetles have gathered on them and then burning them would help to destroy the adults. Early varieties should be sown and their growth stimulated by manures so that the plants will grow sufficiently rapidly to withstand attack. The practice of sowing four seeds close together during four successive weeks ensures a crop. Birds devour the grubs and pupae exposed by the plough, but no predators or parasites have been observed.

A. atripennis is a very similar species, and its life-history and habits closely resemble those of *A. abdominalis*, but in the course of the present study it was found to feed only on *Luffa aegyptiaca* and *L. acutangula*.

AUSTIN (G. D.). **Some Insect Pests of Food Crops.**—*Trop. Agriculturist*, lxvi, no. 4–5, pp. 241–247. Peradeniya, April–May, 1926.

The causes that lead to insect outbreaks and some preventive measures that may be adopted to check or lessen their severity are briefly discussed, and notes are given on some of the commoner insect pests of food crops in Ceylon.

These include, on cucurbits, *Epilachna dodecastigma*, and *E. vigintioctopunctata*, *Aulacophora stevensi* (snake gourd Chrysomelid), *Phytometra* (*Plusia*) *peponis*, *Melittia chalciformis* (snake gourd stem-borer), and *Dacus cucurbitae*; on *Hibiscus esculentus*, the moths, *Sylepta derogata*, *Prodenia litura*, *Cosmophila* (*Anomis*) *erosa*, *Earias fabia*, and *E. insulana*, and *Dysdercus cingulatus*; on beans, the bugs, *Leptoglossus membranaceus*, *Riptortus pedestris* and *Coptosoma cribaria*, and *Agromyza phaseoli*; on *Capsicum* spp. (chillies), Jassids, grasshoppers and *Disphinctus humeralis*. Brief hints on the control of these pests are given.

HUTSON (J. C.). **Cultural Methods in the Control of some Insect Pests.**—*Trop. Agriculturist*, lxvi, no. 4–5, pp. 261–267, 4 refs. Peradeniya, April–May, 1926.

Some of the more important cultural methods that may be employed in combination with other measures for the control of insect pests are discussed.

Jepson (F. P.). **Manuring in Relation to the Control of Shot-hole Borer of Tea.**—*Trop. Agriculturist*, lxvi, no. 4–5, pp. 267–272. Peradeniya, April–May 1926.

The history of the shot-hole borer of tea [*Xyleborus fornicatus*, Eich.] in Ceylon is reviewed, and experiments to determine the value of manuring in lessening infestation by this beetle (which frequently follows a period of lowered vitality of the plant) are described. Though manuring the tea bushes gives no immunity from attack, infestation seems to be somewhat less where bushes have been treated with potash manures and lime. Where a complete manure mixture is used, slightly smaller broods are produced and the number of galleries vacated is greater. Since the primary damage caused to tea bushes by the borer is the weakening of the branches where the galleries occur, often resulting in their fracture, the rapid healing over of the gallery entrances should be stimulated as much as possible. This can be done by liberal cultivation, nitrogen being particularly efficacious, though potash, phosphoric acid and lime are also helpful. While the borer cannot be exterminated or economically reduced, the bushes can be so stimulated by systematic and suitable manuring that the damage may be almost negligible.

On Some Indian Cleridae (Coleoptera). Parts I-II.—*Indian Forest Records*, xii, pt. 8, pp. 209–231. Calcutta, 1926.

Corporaal (J. B.). **New Species of Cleridae from British India and Burma.**—*Ibid.*, pp. 209–216.

Beeson (C. F. C.). **Notes on the Biology of the Cleridae.**—*Ibid.*, pp. 217–231.

Thirty-nine species of Clerids are recorded from India and Burma, and four new species and one new variety are described.

Clerids are generally considered to be among the chief predacious enemies of wood-boring and bark-boring Coleoptera, but the majority of those that have been bred in India have occurred in numbers relatively insignificant compared with those of their prey. The material from which both hosts and predators were bred consisted of logs and timber collected in forests and timber depôts; Clerids were most numerous in wood from artificial environments, but in nearly every case they were heavily outnumbered by the individuals of their hosts that reached maturity. Clerid larvae, as predators on the early stages of boring beetles, appear to be much less efficient natural enemies than parasitic Hymenoptera. The greatest value of Clerids appears to lie in the activity of the adults in preying on the adults of the wood-boring beetles, but even then they never seem to reduce the numbers of their prey disproportionately to their own, and the author considers that their value has been over-estimated.

The relative numbers of three species of Clerids and of their hosts in associated broods, with notes on the host-relationships and periods of emergence of 21 species are given.

Matsumura (S.). **On the Five Species of *Dendrolimus* injurious to Conifers in Japan, with their Parasitic and Predaceous Insects.**—*Jl. Coll. Agric., Hokkaido Imp. Univ.*, xviii, pt. 1, pp. 1–42, 5 pls. Sapporo, May 1926.

This paper covers in part the same ground as a recent one published in Russia [*R.A.E.*, A, xiv, 385].

Dendrolimus albolineatus, Mats. (formerly treated as a variety of *D. sibiricus*) is specially injurious, having done much damage to *Abies*, *Picea* and *Larix* in Saghalien. Keys are given to the adults based on the male genitalia and to the larvae of these moths. The larva of *D. jezoensis*, Mats., and many new varieties of *D. albolineatus*, Mats., *D. spectabilis*, Butl., and *D. punctatus*, Butl., are described. Further Hymenopterous parasites reared from these species are *Pimpla* (*Eremochila*) *jezoensis*, sp. n., from *D. jezoensis*; and *Casinaria takagii*, sp. n., *Pimpla* (*Apechthis*) *dendrolimusi*, sp. n., *P. spectabilis*, sp. n., *Phanomerus spectabilis*, sp. n., and *Monodontomerus spectabilis*, sp. n., from *D. spectabilis*.

FULMEK (L.). **Etliche auf ihren natürlichen Standpflanzen gezüchtete Falter und Motten (Lepidoptera) in Deli (Sumatras Ostküste).** [Some Butterflies and Moths bred on their natural Food-plants in Deli, East Coast of Sumatra.]—*Misc. zool. sumatrana*, iii & v, 4 & 6 pp. Medan, 1926.

This list of Lepidoptera obtained in Deli, Sumatra, is arranged according to their food-plants, some of which are of economic importance.

KADOCSA (G.). **Konyhakerti növényeink állati ellenségei.** [Animal Pests injurious to Vegetable Crops.] [*In Hungarian.*]—122 pp., 32 figs. Budapest, 1923. [Recd. August 1926.]

This work is a general account of the pests of vegetables in Hungary. The insects are dealt with under the crops attacked, with particulars of the part of the plant affected and of recommendations for their control.

WERTH (E.). **Zahlenangaben über Obstschäden in Dahlem.** [Figures of Injury to Fruit Trees in Dahlem.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 7, pp. 51–52. Berlin, July 1926.

Figures are given showing the amount of infestation of various fruit-trees in an experimental garden by various pests, of which only the popular names are given, at certain periods during 1925 and 1926.

KNOCHE (E.). **Einige Bemerkungen über** *Microgaster solitarius* **Ratz., als Nonnenfeind.** [Some Observations on *Apanteles solitarius* as an Enemy of the Nun Moth.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 7, pp. 52–53. Berlin, July 1926.

Referring to Prell's paper [*R.A.E.*, A, xiii, 539] on *Apanteles* (*Microgaster*) *solitarius*, Ratz., as a parasite of the nun moth [*Lymantria monacha*, L.], the author considers that this parasite is not of great importance owing to the fact that its flight period may occur too early in the year and that its attack is limited to the young caterpillars.

WILLE (J.). **Die Ausbreitung der San-José-Schildlaus in Brasilien.** [The Distribution of the San José Scale in Brazil.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 7, pp. 53–55, 1 map, 6 refs. Berlin, July 1926.

This article describes how the San José scale [*Aspidiotus perniciosus*] has been spread in Brazil by human agency and has been found in areas recently brought under cultivation.

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, Beilage no. 7, pp. 117–132. Berlin, 1st July 1926.

The Bavarian regulations regarding the distribution of poisonous insecticides and fungicides and the Costa Rican regulations on the importation of seedlings and parts of plants are given. Preceding issues have been noticed [*R.A.E.*, A, xiv, 309, etc.].

WHITTINGTON (C. E.). **Dusting for Control of the Citrus Aphid.**—*Citrus Indust.*, vi, no. 6, p. 6, 1925. (Abstract in *Expt. Sta. Rec.*, liv, no. 2, p. 155. Washington, D.C., February 1926.) [Recd. July 1926.]

A 3 per cent. nicotine sulphate dust applied at the rate of $\frac{1}{4}$ lb. per tree has given very satisfactory results against the citrus aphis [*Aphis pomi*, DeG.]. The applications were made over 40 acres to 8-year-old trees. The dusting should be done on calm nights, a low temperature having little or no effect on the killing power of the nicotine. Applications should be repeated at 7–10 day intervals until the foliage is too mature for the Aphids to injure it.

DAVIS (W. T.). **The Cicadas or Harvest Flies of New Jersey.**—*New Jersey Dept. Agric.*, Circ. 97, 27 pp., 3 pls., 3 figs. Trenton, N.J., April 1926.

Short descriptive notes are given of the cicadas occurring in New Jersey and of their local distribution, with keys to the genera and to the species of *Tibicen.*

GILBERT (E. M.) & KUNTZ (W. A.). **Some Diseases of** *Aphis spiraecola*, **Patch.**—*Qtrly. Bull. State Plant Bd. Florida*, x, no. 1–2, pp. 1–6. Gainesville, Fla., October 1925–January 1926. [Recd. June 1926.]

During the summer rains in Florida, the numbers of *Aphis pomi*, DeG. (*spiraecola*, Patch) on *Citrus* undergo periodic and severe reduction due to a fungus of the genus *Empusa.* Aphids so killed are of a brown colour, but of normal size, and are generally found attached to the surface of the leaf or twig by the proboscis only, often at an angle of 45°, the body under pressure feeling firm. The life-history of the fungus is described. Infection only takes place in conditions of abundant atmospheric moisture.

Two other diseases attack this Aphid, but are of less importance. One is a fungus belonging to the genus *Cladosporium*, which covers the body of the Aphid with an olive-brown mould. In the early stages the body is hidden under a fluffy or powdery growth, which makes it appear larger than the normal, but as the spores disappear the dark-brown remains of the Aphid body are seen to be much shrivelled and shrunken. This fungus frequently attacks dead Aphids, but may in some cases be the cause of death. White mould of Aphids, caused by a species of *Cephalosporium*, is extremely rare in Florida, and much resembles the brown mould infection in all but colour.

BREITENBECHER (J. K.). **Variation and Heredity in *Bruchus quadrimaculatus*, Fabr. (Coleoptera).**—*Canad. Ent.*, lviii, no. 6, pp. 131–133. Orillia, Ont., June 1926.

Bruchus quadrimaculatus, F., is easily bred in glass vials, the technique being described. The variations in this Bruchid as observed over a period of 8 years are described.

GENTNER (L. G.). **New North American Halticinae (Coleoptera) with Notes on other Species.**—*Canad. Ent.*, lviii, no. 6, pp. 149–154, 1 fig., 5 refs. Orillia, Ont., June 1926.

Haltica canadensis, sp. n., from Manitoba on rose and *Longitarsus menthaphagus*, n. n., for *L. menthae*, Gentner [*R.A.E.*, A, xiii, 237] are described. The latter name, which is preoccupied, was established by the publication of a drawing in connection with a preliminary note on the habits of the insect [*loc. cit.*], but no description has previously been published.

SMITH (L. B.) & HADLEY (C. H.). **The Japanese Beetle.**—*U.S. Dept. Agric.*, Dept. Circ. 363, 66 pp., 2 pls., 36 figs., 10 refs. Washington, D.C., March 1926. [Recd. June 1926.]

This paper summarises all the more important information on *Popillia japonica*, Newm. (Japanese beetle) that has been obtained by the authors and other entomologists since 1917; a large part of it has been noticed from time to time [*R.A.E.*, A, xiv, 154, etc.].

The introduction of *P. japonica* into New Jersey and its spread in that State and in Pennsylvania are discussed [*R.A.E.*, A, xiii, 515, etc.]. Open lowlands with large areas of grass land and a rich vegetation appear to be most favourable to it, and it is in this type of country that it has been spreading at a rate of about 10 to 15 miles a year; it is unlikely, however, that this rate could be maintained in less favourable areas. It is thought that the spread has been mainly due to natural agencies, primarily the flight of the beetles, although it is possible that they may have been carried some distance by streams flowing through infested areas. Vehicles probably do not play an important part in the dispersion of the beetles, which only alight on them for a short time. The chief danger of *P. japonica* being carried over long distances lies in its frequent presence in nursery stock and farm produce; so far as is known, the quarantine and inspection regulations that have been enforced have been successful in preventing this.

A list of about 200 plants on which the adults of *P. japonica* are known to feed in New Jersey is given; it includes nearly all the crops grown in the infested territory. Although the damage to some of the crops in New Jersey caused by the beetles is very considerable, it would probably be much greater in an area where one of the preferred food-plants is grown very extensively than it is in the area at present infested, in which a large variety of crops is grown. Serious damage to grass, strawberries, and other plants is sometimes caused by the larvae when they are very abundant.

The stages and biology of *P. japonica* are fully described [*R.A.E.*, A, xiii, 338, etc.].

The most important indigenous natural enemies of *P. japonica* in the United States are several insectivorous birds, and an attempt has been made to introduce pheasants into the heavily infested area, as they feed readily on the beetles. Indigenous insects in New Jersey that are predacious on *P. japonica* are adults of *Harpalus vagans*, Lec., and *Chlaenius sericeus*, Först., and larvae of *Calosoma calidum*, F., *Poecilus lucublandus*, Say, *Harpalus caliginosus*, F., *Staphylinus mysticus*, Er., *Tabanus sulcifrons*, Macq., and possibly *T. atratus*, F. There has not, however, been any evidence of a decided increase in the numbers of the indigenous species of predators.

An account is given of the introduction of parasites and predators of *P. japonica* into New Jersey, much of which work has been previously noticed [*R.A.E.*, A, xiii, 338; xiv, 155, etc.]. For rearing Tachinids from puparia for release in New Jersey a special cage was used, consisting of a box the top of which was covered with 24-mesh copper wire screening, with a section of 10-mesh copper wire screening 4 inches below it. By this means the Tachinids, on emerging, were confined to the lower part of the box, whence they were released through a door, while hyperparasites, if present, were able to penetrate to the upper part. In 1922 adults of *Scolia manilae*, Ashm., were introduced from Hawaii, and one generation was reared from them in greenhouses, but it is doubtful whether this wasp can survive the winter in New Jersey; the grubs stung by *S. manilae* are permanently paralysed, and many are thus attacked before any eggs are laid. Attempts to introduce *Elis obscura*, F., *E. quinquecincta*, F., and *Tiphia* sp. from Illinois, and the Neuropteron, *Ithone fusca*, Newm., from New South Wales, have been unsuccessful. Some of the eggs of *I. fusca* that were imported hatched, but the larvae died in the first instar. Adults of *Carabus nemoralis*, Müll., from Massachusetts, fed readily on larvae of *P. japonica* placed on the ground, but were unable to find them below the soil.

The authors consider that the establishment of at least one parasite (*Centeter cinerea*, Ald.) of this pest in the United States will cause a gradual diminution in its numbers, and that it will be brought under control by degrees, and the damage it does almost, if not entirely, prevented.

The information given on the control of the larvae of *P. japonica* in grass land and in nurseries and nursery products and of the adults on fruit trees has mostly been noticed [*R.A.E.*, A, xiii, 380–382, etc.].

Geraniol, which has a strong attraction for the adults of *P. japonica*, has been found to occur to a greater or less extent in all the preferred food-plants of the beetles; the possibility of using it in a spray is being investigated.

HORI (H.). **A New Psychid from Japan.** [*In Japanese.*]—*Kontyu*, i, no. 1, pp. 28–30, 1 pl. Tokyo, June 1926.

The larvae of *Eumea niphonica*, sp. n., feed on the leaves of *Pinus densiflora* and *P. thunbergi* in Japan. They pupate in April, the adults emerging in May or June. There is one generation a year, hibernation occurring in the larval stage.

Ishii (T.). **On Hymenoptera parasitic upon Coccidae.** [*In Japanese.*]—*Kontyu*, i, no. 1, pp. 31–36. Tokyo, June 1926.

A general account is given of the biology of the Hymenoptera that are parasitic on Coccids. In Japan *Coccus hesperidum* is parasitised by *Microterys flavus*, *Pareusemion studiosum*, *Coccophagus yoshidae*, *C. lecanii*, *Aphycus pulvinariae*?, *Encyrtus barbatus* and *Anicetus annulatus*. *Pseudaonidia duplex* is parasitised by *Comperiella unifasciata* and *Aphelinus* sp., and *Chrysomphalus aurantii* and *C. aonidum* by *Comperiella bifasciata* and *Aphelinus* sp.

Hitaka (Y.). **On** *Pyrestes* **sp. (Cerambycidae).** [*In Japanese.*]—*Kontyu*, i, no. 1, pp. 42–43. Tokyo, June 1926.

In Kumamoto the camphor and allied trees are attacked by the larvae of a Cerambycid of the genus *Pyrestes*. They bore into and cause withering of the branches, trees under 15 years of age being chiefly infested. The adults emerge in May or June.

Ogami (T.). **Lead Arsenate and its Poisonous Effects (I).** [*In Japanese.*]—*Kontyu*, i, no. 1, pp. 44–54. Tokyo, June 1926.

A historical account is given of lead arsenate as an insecticide.

Harukawa (C.). **On the Control of** *Chilo simplex* **by Flooding.** [*In Japanese.*]—*Jl. Agric. Soc. Japan*, no. 282, pp. 191–198. Tokyo, May 1926.

By submerging a rice-field for 24 hours, 60 per cent. of the larvae of *Chilo simplex* may be killed in the stems, but this measure somewhat reduces the crop. [*Cf. R.A.E.*, A, ix, 6; x, 36.]

Shipley (Sir A. E.). **Bookbinding for the Tropics.**—*Trop. Agriculture*, iii, no. 7, pp. 141–142. St. Augustine, Trinidad, July 1926.

Since the publication of a previous note [*R.A.E.*, A, xiv, 5] the author has compiled additional information from various sources regarding the best methods of treating books in the tropics. Several formulae are given as repellents for termites, mercury bichloride being the basis of practically all of them. Crude carbolic acid at the rate of 1 gal. per sq. ft., 0·049 oz. of mercury bichloride per sq. ft., or 0·113 oz. of copper sulphate per sq. ft. have all proved successful against termites. It is suggested that binders made of asbestos bound together by metal may be found advisable in the tropics, or covers made of wood fibre board, treated as suggested.

King (K. M.). **The Red-backed Cutworm and its Control in the Prairie Provinces.**—*Canada Dept. Agric.*, Pamphlet 69 (N.S.), 13 pp., 3 figs. Ottawa, June 1926.

Cutworms are serious pests in Saskatchewan, the damage caused directly by them in 1925 being estimated at over £800,000. The most important species is *Euxoa ochrogaster*, Gn. (red-backed cutworm), which feeds on a great many crops, being especially injurious to sweet clover, flax, sunflowers and maize. The eggs are laid in dry, loose soil during late summer and hatch in the spring. The cutworms feed on the surface at night and attack the growing crops from 15th May to 20th June, no spring-sown crops apparently being immune, though autumn rye is said to be resistant. Cultural methods, including summer fallowing and rolling after sowing, are recommended for the reduction of damage, particularly to small grain crops. The most effective remedy is a poison bait, which should be broadcast on a warm evening, the formula recommended being 100 lb. bran with 4 lb. white arsenic (or 2 lb. Paris green) and 1 gal. cheap cane molasses in 7 or 8 gals. water.

Another injurious species in Saskatchewan is *Porosagrotis orthogonia*, Morr. (pale western cutworm), for which poison bait is ineffectual, so that in infested fields nothing can be done until the cutworms have finished feeding ; by summer-fallowing, however, infestation in the following year may be prevented. *Euxoa tristicula*, Morr. (early cutworm) appears early, and when it is abundant, sowing should be delayed until about the last week in May, when it will have finished feeding.

MAKGILL (R. H.). **Deterrent Sprays for Pear Midge.**—*N.Z. Jl. Agric.*, xxxii, no. 5., pp. 311–315. Wellington, N.Z., 20th May 1926.

Further experiments with deterrent sprays for the pear midge [*Perrisia pyri*, Bch.] [*R.A.E.*, A, xiii, 404] have led to the conclusion that nicotine and naphthalene are both effective when applied weekly during October, so that a good crop of leaves may be established and the fruit set ; with young pear trees, by carrying on the spraying during November, a fair growth may be established before the midge becomes too active. Towards the end of November, and in December, however, deterrents become of little use. Size was found to be an excellent carrier, and a spray mixture was used containing, in each 10 gals., 5 oz. of size, 2 oz. (1 : 800) 40 per cent. nicotine sulphate and 1 lb. naphthalene powder, a small quantity of soap being added. Oil sprays in the spring scorched the foliage even when used at as low a strength as 1½ per cent. Repeated sulphur dusting is also harmful to the leaves of pear.

TOTHILL (J. D.). *Levuana iridescens* **Campaign.**—*Legis. Council, Fiji*, Paper no. 71, 3 pp. [Suva] 2nd December 1925. [Recd. July 1926.]

A detailed account is given of the importation of the Tachinid, *Ptychomyia remota*, from the Federated Malay States into Fiji against the coconut pest, *Levuana iridescens* [*R.A.E.*, A, xiii, 560]. This fly, of which 300 individuals were received alive in Fiji, is now definitely established and is parasitising up to 75 per cent. of the moth. The predacious Clerid, *Callimerus* [*arcufer*], has also been obtained in sufficient numbers to liberate a colony and has completed a generation on the same host. It breeds slowly, however, and its general distribution will require some years.

TOTHILL (J. D.). *Levuana iridescens* **Campaign.**—*Legis. Council, Fiji*, 4 pp. [Suva] 1926. [Recd. July 1926.]

Since the publication of the foregoing report, a method has been devised for increasing the stock of *Callimerus arcufer*, and a number of colonies have been reared and distributed. Particulars are given of the method of spraying against *Levuana iridescens* [*R.A.E.*, A, xiii, 559]. It was found that 2 to 2½ lb. lead arsenate in 40 gals. gave better results than the 1½ lb. previously advocated. When a leaf has once been thoroughly sprayed, it is protected for its life against *L. iridescens*, but when dealing with an outbreak in a fresh area, where extermination is aimed at, spraying would have to be done at fairly frequent intervals on account of the new leaves, which unfurl at the rate of about one a month on vigorous coconut palms. The estimated cost of spraying is worked out. It is thought that the original home of this moth may prove to be Cochin China or New Guinea. Several species of insectivorous birds have been introduced from Ceylon and India, and their behaviour is being studied before they are liberated.

From the 300 adults of *Ptychomyia remota* introduced in 1925, 32,621 flies have been reared and liberated in 38 colonies, and the parasite is now spreading so rapidly that no further liberations appear to be necessary. In some cases 2 and 3 miles of open water have been traversed by the parasite in its dispersal. A rate of parasitism of 75 per cent. is commonly attained, 80 and 85 per cent. is not rare, and 90 per cent. is occasionally reached. This, with other enemies that include an Attid spider, the predacious bugs, *Oechalia consocialis*, *Platynopus malacanthus* and *Canthecona cyanacantha*, may be a sufficient check on the pest without further introductions. A Braconid, *Apanteles* sp., is now being studied in Malaya, with a view to its introduction into Fiji if needed.

TOTHILL (J. D.). **Transparent Scale of Coconuts.**—*Legis. Council, Fiji*, 3 pp. [Suva] 1926.

The history and distribution of *Aspidiotus destructor*, Sign. (Bourbon or transparent scale) in the Fijian Islands are discussed. In the last 10 years it has spread rapidly, and there are now very few places on the Islands where coconuts can be grown without fear of infestation. There is apparently no means of stopping its extension, and spraying is impracticable owing to lack of roads in the coconut areas. Unhealthy trees are particularly susceptible to attack, swampy ground apparently encouraging infestation ; therefore any measure that will improve the health of the trees will automatically reduce the injury. The cleaning up of undergrowth has been successful, and a judicious thinning of the trees should be beneficial. The parasites, *Aspidiotiphagus citrinus*, Craw, which already occurred in Fiji, and *Aphelinus chrysomphali*, Mercet, introduced from Tahiti, are insufficient to control the pest ; a number of other parasites are known in other regions, and it is suggested that the Coccinellids, *Cryptognatha nodiceps*, Mshl., and *Azya trinitatis*, Mshl., might be introduced from British Guiana with advantage. A list of the known food-plants of *A. destructor* is appended.

WOLFF (M.) & KRAUSSE (A.). **Beiträge zur Kenntnis der Biologie von Oelfruchtschädlingen, insbesondere über den Anteil der von** *Ceuthorrhynchus assimilis* **Payk. verursachten, fälschlich dem** *Meligethes aeneus* **F., zugeschriebenen Schäden.** [Contribution to the Knowledge of the Biology of the Pests of Oil-bearing Crops, especially of the Share in the Damage by *C. assimilis*, falsely ascribed to *M. aeneus*.]—*Arch. Natg.*, Abt. A, xci (1925), no. 4, pp. 1–45, 2 pls., 27 refs. Berlin, May 1926.

The most important pests of rape are weevils, especially *Ceuthorrhynchus assimilis*, Payk., and not *Meligethes aeneus*, F., to which much of the damage done is considered to have been wrongly attributed [*cf. R.A.E.*, A, ix, 547–9; x, 464]. Much of the information on the biology of this weevil is here repeated.

Meligethes aeneus, F., and *M. iridescens*, F., occur largely in association, but the biology of the latter still needs investigation. Pairing in *M. aeneus*, which hibernates as an imago and has only one generation a year, always follows hibernation. Only two larval moults were observed. This beetle is attacked by a spider, *Theridium impressum*, Koch, and from it the authors have bred *Isurgus morionellus*, Holmgr., but not *I. heterocerus*, Thoms.

PRIESNER (H.). **Thysanopterologica. II.**—*Zool. Jahrb.*, Abt. f. System. Oekol. und Geog., lii, no. 2–3, pp. 267–278, 4 figs., 2 refs. Jena, 1926.

Thysanoptera recorded from Hungary include *Thrips origani*, sp. n., in the flowers of *Origanum vulgare*, which the author believes to have been confused with *T. tabaci*, Lind.

BAUNACHE (—). **Unsere Kohlweisslinge.** [Our Cabbage Whites.]—*Die kranke Pflanze*, iii, no. 7, pp. 123–125, 1 pl. Dresden, July 1926.

The distinctions between the three cabbage butterflies found in Germany, *Pieris brassicae*, L., *P. napi*, L., and *P. rapae*, L., are described. Collection of the larvae is the best measure against them.

TEMPEL (W.). **Ueber ein starkes Auftreten des Rosskastanienspanners.** [On an Outbreak of the Horse Chestnut Geometrid.]—*Die kranke Pflanze*, iii, no. 7, pp. 126–127. Dresden, July 1926.

A severe infestation is recorded in Saxony of an orchard of apple, plum and cherry trees by the Geometrid, *Anisopteryx aescularia*, Schiff. The larvae begin to appear early in April. At the end of May or early in June they descend to the ground to pupate. Hibernation occurs in the pupal stage, the adults emerging in February and March. Oviposition occurs from the end of February to early April, the eggs being laid in rings round the twigs. Adhesive bands must be kept in good condition between the end of January and the beginning of April in order to catch the wingless females, and arsenicals in spray or dust form should be used in April and May against the young caterpillars.

SCHÖPPACH (—). **Drahtwurm!** [Wireworms.]—*Die kranke Pflanze*, iii, no. 7, pp. 127–129. Dresden, July 1926.

An infestation of oats and barley by wireworms was checked by using a heavy roller, spreading potassium nitrate on the rolled area at the rate of about 100 lb. per acre, and finally raking with a light harrow.

FISCHER (F.). **Ueber die Heu- und Sauerwurm-Bekämpfung.** [On Work against the Spring and Summer Generations of Vine Moths.]—*Nachrichten über Schädlingsbekämpf.*, i, no. 2, pp. 93–94. Leverkusen b. Köln, May 1926. [Recd. July 1926.]

A proprietary substance, Nosprasen, has been found satisfactory against the spring and summer generations of vine-moths [*Clysia* *ambiguella* and *Polychrosis botrana*] in Germany. This preparation contains colloidal copper directed against *Peronospora* and arsenic against vine-moths. It is dissolved in water, and then neutralised with lime in the same way as copper sulphate and lime mixture.

Marelli (C. A.). **La plaga de gorgojos de los Eucaliptos, debida a** "*Dacnirotatus bruchi*" **Mar., y experiencias sobre la desinsectación de los arboles atacados.** [The Weevil Outbreak on *Eucalyptus* Trees due to *D. bruchi*, and Experiments on Disinfestation of the Trees affected.]—*Mem. Minist. Obras Publicas Prov. Buenos Aires*, 1924–25, pp. 597–646, 2 figs., 3 pls. Buenos Aires, 1926.

Eucalyptus globulus, grown as an ornamental tree in Argentina, has been attacked in the Zoological Garden at La Plata by a new Curculionid, *Dacnirotatus bruchi*, gen. et sp. n. The adults feed on the leaves, on the backs of which the females oviposit. The larvae mine the leaves and also destroy the tender shoots. Pupation takes place in the ground. The measures adopted consisted in turning up the ground to uncover the pupae, which are usually found at a depth of about an inch. These, as well as the adults and larvae, were collected and burnt, and it is estimated that over 170,000 individuals were dealt with in this way. A closely allied species, *D. platensis*, sp. n., found at the same time, is also described.

[The genus *Dacnirotatus* is undoubtedly the same as the Australian genus *Gonipterus*, Schh., and *D. bruchi* is almost certainly a synonym of *G. scutellatus*, Gyll., which has also been introduced into South Africa and has there done serious damage to *Eucalyptus*. *D. platensis* will probably prove to be a synonym of some other Australian species.—Ed.]

Heikertinger (F.). **Resultate fünfzehnjähriger Untersuchungen über die Nahrungspflanzen einheimischer Halticinen.** [Results of 15 years' Investigations on the Food-plants of Central European Halticinae.]—*Ent. Bl.*, xx, pp. 214–224; xxi, pp. 10–19, 81–92, 119–131, 155–163; xxii, pp. 1–9, 49–62, 19 figs. Berlin, 1924–26.

The title of this paper indicates its contents.

Prell (H.). **Der Ernährungsfrass des grossen Lärchenborkenkäfers** (*Ips cembrae* **Heer**) **und seine praktische Bedeutung.** [The Feeding of the Large Bark-beetle of Larch, *I. cembrae*, and its practical Importance.]—*Ent. Bl.*, xxii, no. 2, pp. 62–76, 3 figs., 18 refs. Berlin, 30th June 1926.

The discovery in Bohemia that *Ips cembrae*, Heer, is capable of causing severe injury to larch by mining the bases of the twigs [*R.A.E.*, A, xiii, 603] is confirmed. The individuals concerned are the newly emerged adults that have not paired and that, in the females, have undeveloped oviducts.

Scholz (R.). **Zur Lebensgeschichte der** *Phytodecta flavicornis* **Suffr.** [A Contribution to the Life-history of *P. flavicornis*.]—*Ent. Bl.*, xxii, no. 2, pp. 87–89. Berlin, 30th June 1926.

After hibernating under leaves at the foot of willows, the adults of *Phytodecta flavicornis* ascend the tree in spring and feed on the newly opened leaves. The eggs, 20 to 30 per female, are laid on the leaves. The gregarious larvae partly skeletonise the leaves and pupate in the ground.

STELLWAAG (F.). **Die Massenbewegung der Traubenwickler im Verhältnis zur Witterung.** [The Variation in Abundance of Vine-moths in Relation to Weather.]—*Pfalz-Wein*, no. 35, reprint, 3 pp. [*sine loco*, ? 1925.] [Recd. July 1926.]

As compared with *Polychrosis botrana*, Schiff., *Clysia ambiguella*, Hb., requires cooler and moister conditions, weather conditions that suit one species of moth having an unfavourable effect on the other. The author's observations in the Rhine Palatinate for the years 1917–1921 are given. Owing to changes in the weather, one species may predominate in spring and the other in summer. Thus no two years are alike as regards abundance, and though the number of pupae found in early spring has sometimes been thought to be an indication of future infestation, no true forecast can be made of the summer incidence of these pests.

STELLWAAG (F.). **Die diesjährigen Erfahrungen bei der Heu- und Sauerwurmbekämpfung in der Pfalz.** [This Year's Experiences in combating the Spring and Summer Generations of Vine-moths in the Palatinate.]—*Der Deutsche Weinbau*, no. 42, reprint, 4 pp. [*sine loco*, 1925.] [Recd. July 1926.]

In 1925 the vine-moths [*Clysia ambiguella* and *Polychrosis botrana*] were exceedingly abundant in many districts in Central Europe, especially in the Rhine Palatinate. *C. ambiguella* has been long-established in the region, *P. botrana*, which requires more warmth, having spread there more recently. In 1925, when the nights were cold and there was much rain in the first half of the year, *P. botrana* was almost absent, while *C. ambiguella* occurred everywhere in large numbers, and the flight period of its spring generation merged into that of the summer one without any noticeable decrease in abundance. These conditions had never been recorded previously. The larvae also mined the stems of the flower-clusters to an extent not previously recorded in Europe. Sturm's preparation of arsenic was successful where the work was properly carried out, and all the experience gained in 1925 confirms the correctness of the view that measures against the spring generation are of the utmost importance. Insecticides must be applied before, during and after flowering. A dust of Urania green and one of Silesia green also proved effective. These should be added at the rate of 2–2½ per mille to the lime and copper sulphate mixture employed against *Peronospora.*

STELLWAAG (F.). **Wie kann ich den Heu- und Sauerwurm wirksam und wirtschaftlich bekämpfen?** [How can I combat the Spring and Summer Generations of the Vine-moths effectively and economically?]—*Merkblatt staatl. Lehr- u. Versuchsanst. Wein- u. Obstbau*, no. 8, 6 pp. Neustadt a. d. Haardt, March 1926. [Recd. July 1926.]

This circular describes in a popular form the best methods of combating the vine moths [*Clysia ambiguella* and *Polychrosis botrana*] under the conditions obtaining in the vine-growing districts on the Rhine.

KIEFFER (N.). **Zum diesjährigen Heuwurmbefall.** [On this Year's Infestation by the Spring Generation of Vine-moths.]—*Luxemburger Weinzeitg.*, xiv, no. 14, pp. 218–220. Grevenmacher, 10th July 1926.

In 1926 the spring generation of the vine-moths [*Clysia ambiguella* and *Polychrosis botrana*] was scanty in Luxemburg, and there was a marked difference in the degree in which various varieties of vines were attacked.

KRIEG (H.). **Bekämpfung fressender Forstschädlinge vom Flugzeug.** [Work from Aeroplanes against Insects injurious to Forests.] — *Verh. Deutsch. Ges. angew. Ent., 5. Mitgliederversamml. Hamburg 16. bis 20. Sept. 1925*, pp. 25–28. Berlin, 1926.

The information given here is substantially the same as that in a paper already noticed [*R.A.E.*, A, xiii, 539].

JABLONOWSKI (J.). **Ueber die vermeintlichen Fritfliegenschäden.** [On Injury supposed to be due to the Frit-fly.]— *Verh. Deutsch. Ges. angew. Ent., 5. Mitgliederversamml. Hamburg 16. bis 20. Sept. 1925*, pp. 28–29. Berlin, 1926.

The economic importance in Hungary of *Limothrips cerealium*, Hal., is negligible, but *Thrips frumentarius*, Bel., is of more consequence. Some of the injury apparently due to thrips is, however, not caused by insects at all, and white-ear disease is considered to be due to frost. In the discussion on this statement, Blunck questioned whether Thysanoptera could be entirely absolved in connection with white-ear disease and instanced cases in point, concluding that further study was needed before accepting in Germany the results obtained in other countries.

RHUMBLER (L.). **Maikäferflüge in Münden.** [May-beetle Flights at Münden.]— *Verh. Deutsch. Ges. angew. Ent., 5. Mitgliederversamml. Hamburg 16. bis 20. Sept. 1925*, pp. 30–40, 16 refs. Berlin, 1926.

Observations on flights of *Melolontha melolontha* (*vulgaris*) in the evenings along defined narrow tracks led to the conclusion that the course of these evening flights is determined by impressions received by the smell and sight organs of the beetles that are either seeking to feed or to mate. The signal for starting the flight is possibly given by the rise in air pressure.

VON VIETINGHOFF-RIESCH (A.). **Prinzipielles zur Frage der Schädlingsbekämpfung durch Vögel, besonders in forstlicher Beziehung.** [Principles of Insect Control by Birds, especially as regards Forestry.]— *Verh. Deutsch. Ges. angew. Ent., 5. Mitgliederversamml. Hamburg 16. bis 20. Sept. 1925*, pp. 40–48. Berlin, 1926.

This paper discusses the value of birds as destroyers of insects, particularly in forests, and the conditions under which their presence is most beneficial.

ZACHER (F.). **Schädlinge in Rohkakao, Schokolade, Marzipan und ähnlichen Erzeugnissen.** [Pests in Raw Cacao, Chocolate, Marzipan and similar Products.]—*Verh. Deutsch. Ges. angew. Ent., 5. Mitgliederversamml. Hamburg 16. bis 20. Sept. 1925*, pp. 68–69. Berlin, 1926.

In Germany *Ephestia elutella*, Hb., is the most important pest in the chocolate industry. This moth is chiefly on the wing from May to August, though some adults occur throughout the year. The incubation period lasts 5 or 6 days from April to June. The rate of development varies with the temperature, moisture and kind of food. The shortest larval stage (58 days) occurred with nougat as the food, while with marzipan, milk chocolate, etc., a longer time was necessary, pupation not having occurred after 178 days in some cases. The time varies considerably, however, with a given food. At room temperature the shortest total development period was 78 days and the longest over 192. There may be more than 1–2 generations a year. Remedial measures are hampered in chocolate factories by the danger of interfering with the aroma and flavour of the products. Experiments are being made with carbon dioxide and with electric currents. In some cases *Microbracon* (*Habrobracon*) *hebetor*, Say (*juglandis*, Ashm.) was observed parasitising *E. elutella* in large numbers.

Other insects in cacao warehouses included *Ephestia cautella*, Wlk., *Araecerus fasciculatus*, DeG., *Sitodrepa panicea*, L., *Ptinus tectus*, Boield, *Necrobia rufipes*, DeG., *Alphitobius piceus*, Ol., *Tribolium confusum*, Duv., *Cathartus* (*Ahasverus*) *advena*, Wlt., *Silvanus* (*Oryzaephilus*) *mercator*, Fauv., and *Carpophilus dimidiatus*, F. Occasional insects present included *Anobium pertinax*, L., *Dermestes lardarius*, L., *D. frischi*, Kg., *Chrysopa* sp., *Cassidula vittata*, Vill., and a number of Diptera.

Laboratory experiments showed that the larvae of the meal moth [*Ephestia kühniella*] will attack chocolate, contrary to recorded statements, but only do so if accustomed to this diet from the time of hatching.

Commenting on this paper, Dr. Reh states that a practical test in the fumigation of a chocolate factory with hydrocyanic acid gas has shown this insecticide to fulfil all requirements against *E. elutella*.

BEGEMANN (H.). **Verslag van den Entomoloog over het tijdvak 3 December 1924–31 December 1925.** [Report of the Entomologist of the Coffee-berry Borer Fund for the Period 3rd December 1924—31st December 1925.]—*Meded. Koffiebessenboeboek-Fonds*, no. 14, pp. 194–207. Malang, 1926.

Chief attention was given to *Prorops nasuta*, Wtrst., the parasite of the coffee-berry borer, *Stephanoderes hampei*, Ferr., which was imported from Uganda, and is being bred in increasing numbers in Java. Females have lived up to a maximum of 69 days, and some laid up to 28 eggs, though the average was 8. They are laid in prepupae or pupae of the beetle that have been previously injured by a stab of the ovipositor, and 8–10 days later the larvae are full-grown and begin spinning their cocoons. The adults emerge after about 14 days. Unfertilised eggs appear to yield males. The parasite injures several larvae and pupae before laying an egg, and these die in a few days. The breeding of the parasite has proceeded satisfactorily; at Malang some 2,541 were obtained in December 1924, and this figure rose to 68,839 in November 1925, followed by a decrease to 32,791 in December. There should therefore be no lack of parasites for distribution to the coffee estates. The feeding of the parasites for two or three days on sugar water has been found to be unnecessary, and the breeding of *P. nasuta* is so simple that planters should be able to do it for themselves.

S. hampei has been successfully bred on berries of *Coffea schumanniana* [*cf. R.A.E.*, A, xiii, 12], and has been found in the stems and pods of *Centrosema plumieri* and in the pods of *Tephrosia* and *Crotalaria*, though whether it breeds in these green manure plants is unknown.

The pods of *Centrosema plumieri* that contained *S. hampei* also harboured two other species of beetles, both of which attacked coffee berries experimentally. One infested the pulp, while the other bred in the seeds. This latter species, which is not distinguishable from *S. hampei* at a glance, also occurs in stems of *Crotalaria* and *Tephrosia* and breeds in berries of *C. schumanniana*.

Other pests of coffee included *Pseudococcus citri*, Risso (white scale), an imported Coccinellid enemy of which, *Cryptolaemus montrouzieri*, Muls., has been bred at the station. Owing to the dry weather during the year, the lamtoro scale, *Pseudococcus virgatus*, Ckll., did considerable harm to coffee. The red coffee borer, *Zeuzera* [*coffeae*, Nietn.], infested the stems of the green manure plant, *Crotalaria anagyroides*. Much injury was done to coffee in a high-lying estate by bagworms. Collection is the only measure advised against these caterpillars, which may remain alive for five months without pupating, so that a good deal of damage can be done by them.

Pests of green manure plants included green Capsid bugs on *Crotalaria anagyroides* and an Agromyzid attacking the shoots of *Calopogonium*.

BEGEMANN (H.). **Nieuwe methoden voor de ontsmetting van koffiezaad.** [New Methods for the Disinfestation of Coffee Seed.]—*Meded. Koffiebessenboeboek-Fonds*, no. 14, pp. 208–216. Malang, 1926.

Experiments were undertaken to discover a fumigant capable of killing *Stephanoderes* [*hampei*, Ferr.] in coffee seed without injuring the latter and permitting subsequent storage of the seed for several months. Turpentine appears to be satisfactory for this purpose, and the method advocated is as follows: In a suitable, air-tight chamber the coffee seed is spread in layers not more than 1¼ inch thick between fabrics wetted with turpentine. After keeping the container hermetically closed for 3 days, the seed is taken out and exposed freely to air for a day, after which it can be stored. Carbon dioxide is also a suitable fumigant. The seed is placed in bottles or tins and carbon dioxide is introduced until the oxygen is driven off, and the container is then closed with a cork soaked in paraffin wax. This will kill all stages of the beetle in 14 days. A development of this method of fumigation is based on the discovery by Dr. Ultée that coffee seed stored in hermetically closed containers soon consumes all the oxygen present. If coffee seed be placed in such a container with dry wood charcoal, a period of one month will destroy *S. hampei*, no introduction of carbon dioxide being necessary.

WATSON (J. R.). **Adiciones a los Thysanoptera de Cuba.** [Additions to the Thysanoptera of Cuba.]—*Mem. Soc. Cubana Hist. nat. " Felipe Poey "*, vii, no. 1–2, pp. 46–47. Havana, 1926.

These records supplement those listed by Cardin in 1918 [*R.A.E.*, A, vii, 348]. They include *Frankliniella citripes*, Hood, from flowers of *Citrus ; F. tritici*, Fitch, from flowers of avocado (*Persea gratissima*), orange (*Citrus aurantium*), and other plants ; and *Haplothrips merrilli*, Watson, *H. cubensis*, Watson, *Franklinothrips vespiformis*, Crawford, *Hindsiana cocois*, Watson, *Symphyothrips punctatus*, Hood & Williams, and *Aleurodothrips fasciapennis*, Franklin, all from beneath the scales of the calyx of coconut.

SPENCER (H.) & HENDERSON (H. J.). **The Control of Squash Insects.**—*Virginia Truck Expt. Sta.*, Bull. 52, pp. 399–414, 8 figs., 4 refs. Norfolk, Va., 1st July 1925. [Recd. July 1926.]

The growing of squashes in Virginia might be much more profitable were it not that all but very early plantings are unproductive, owing to insect pests. These include *Smynthurus* sp. (springtails), *Diabrotica* spp. (cucumber beetles), *Melittia satyriniformis*, Hb. (squash borer) and *Epilachna borealis*, F. (squash beetle), which are always present in destructive numbers, and *Anasa tristis*, DeG. (squash bug), *Diaphania* spp. (pickle and melon worms) and *Aphis gossypii*, Glov., which are injurious in some seasons. The life-history of *M. satyriniformis* under conditions in Eastern Virginia is discussed, and a brief account of the other pests is given.

General remedial measures against these insects include planting the first crops as early and the last ones as late as possible to avoid periods of maximum insect damage ; dusting 3 or 4 times with hydrated lime or 3 per cent. nicotine dust when plants are young ; stimulating growth by manure and fertilisers ; and thorough spraying weekly from 1st June to 15th July and from 15th August to 30th September with 1 part nicotine sulphate to 100 parts water. Summer crops should be planted about 1st July to escape squash borers, and if beetles appear in numbers, the lower surface of the leaves should be dusted with 1 part calcium arsenate or zinc arsenite to 6 parts hydrated lime, or sprayed with the same materials using 2½ lb. of arsenical to 4 lb. hydrated lime in 50 U.S. gals. water. As soon as the crop is over, the remnants should be ploughed in and another cultivated crop grown on the land.

BRITTON (W. E.) & CLINTON (G. P.). **Spray Bulletin.**—*Connecticut Agric. Expt. Sta.*, Bull. 271, pp. 93–140, figs. New Haven, Conn., January 1926. [Recd. July 1926.]

This spray calendar gives directions for dealing with the common insect pests of cultivated plants.

BRITTON (W. E.). **Twenty-fifth Report of the State Entomologist of Connecticut, 1925.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 215–330, 20 pls., 13 figs. New Haven, Conn., February 1926. [Recd. July 1926.]

Insects of the year not mentioned in the last report [*R.A.E.*, A, xiii, 411] nor dealt with in special papers, include, on fruit-trees, *Eriophyes pyri*, Nal. (pear-leaf blister-mite) ; *Eucosma* (*Tmetocera*) *ocellana*, Schiff. (bud moth) ; *Schizura concinna*, S. & A. (red humped caterpillar), which strips the leaves from young apple trees ; the flea-beetle, *Crepidodera rufipes*, L., defoliating young peach trees ; *Haltica* (*Altica*) *chalybea*, Ill. (grape-vine flea-beetle) ; *Euphoria inda*, L. (bumble flower beetle) ; *Rhagoletis pomonella*, Walsh (apple maggot) ; *Myzus persicae*, Sulz. (green peach aphis) ; *Lepidosaphes ulmi*, L. ; *Aspidiotus perniciosus*, Comst. ; and *Chionaspis furfura*, Fitch (scurfy scale) on young pear and apple trees.

Pests of vegetables include *Melittia satyriniformis*, Hb. (squash borer) ; *Leptinotarsa decemlineata*, Say (Colorado potato beetle) ; *Diabrotica vittata*, F. (striped cucumber beetle) ; *Pegomyia hyoscyami*, Panz. (spinach leaf-miner), which also infests beets ; *Lygus pratensis*, L. (tarnished plant bug) on potatoes ; and *Anasa tristis*, DeG. (squash bug). Field crops were attacked by *Cirphis unipuncta*, Haw. (army worm) ; and white grubs, *Lachnosterna* (*Phyllophaga*) spp.

Shade and forest tree pests include *Pulvinaria vitis*, L. (cottony maple scale) ; *Toumeyella liriodendri*, Gmel. (tulip tree scale) ; *Asterolecanium variolosum*, Ratz. (pit-making oak scale) ; *Phenacoccus acericola*, King (woolly maple leaf scale) ; *Chionaspis pinifoliae*, Fitch (pine leaf scale) ; *Phylloxera caryaecaulis*, Fitch (hickory leaf-stem gall aphis) ; *Neoprociphilus aceris*, Monell, on maple ; *Chermes abietis*, L. (spruce gall aphis) ; *Hyphantria cunea*, Drury (fall webworm) ; *Diprion* (*Neodiprion*) *simile*, Hart., on pine twigs, and *D.* (*N.*) *pinetum*, Nort., on red pine ; *Cryptorrhynchus lapathi*, L. (poplar and willow curculio) ; *Eriophyes quadripes*, Shim. (bladder gall mite) on silver maple [*Acer saccarhinum*] ; *Plagiodera versicolor*, Laich. (willow leaf beetle) ; and *Galerucella xanthomelaena*, Schr. (elm leaf beetle).

Household pests were the cockroaches, *Blatta orientalis*, L., and *Blattella germanica*, L. ; *Attagenus piceus*, Oliv. (black carpet beetle) ; *Anthrenus scrophulariae*, L. (common carpet beetle) ; *Tineola biselliella*, Humm. (common clothes moth) ; *Calandra granaria*, L. ; *Ephestia kühniella*, Zell. ; and *Sitodrepa panicea*, L. (drug store beetle).

Miscellaneous pests include *Monarthropalpus buxi*, Lab. (box leaf-miner) and *Dichomeris marginellus*, F. (juniper webworm).

Tobacco in some localities was severely damaged by the wireworm, *Pheletes* (*Limonius*) *agonus*, Say, and, to a less extent, by *Asaphes* sp. and *Melanotus* sp. The damage done by *P. agonus* was severe in early June, but after a few days the wireworms disappeared, probably descending deep into the soil to escape the extreme heat ; very little is known of the life-history of this Elaterid, and it may require anything between 2 and 6 years for complete development. Tests with carbon bisulphide emulsion, applied with the tobacco setter when plants were being reset, indicated that any strength capable of killing the wireworms also killed the plants. Calcium cyanide was also effective, but killed the plants. In California, where beans are often injured by wireworms, the growers plant every 4th or 5th row with split seeds, which will germinate but will not grow into strong plants. These weak plants attract wireworms ; they can then be treated with calcium cyanide, which will kill both them and the insects, and after a few days the crop can be planted without fear of injury.

Ashworth (J. T.) & Britton (W. E.). **Report of the Gipsy Moth Work, Year ending 30th June 1925.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 253–272, 1 map. New Haven, Conn., February 1926. [Recd. July 1926.]

A brief account is given of the work carried out against the gipsy moth [*Porthetria dispar*,L.] in each town in Connecticut, arranged by counties. Only one parasite, *Anastatus bifasciatus*, Boy., was liberated in the State in 1925.

Zappe (M. P.) & Stoddard (E. M.). **Further Experiments in Dusting and Spraying Apple Orchards. Efficiency of Delayed Dormant Applications for the Control of Apple Aphids.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 272–280. New Haven, Conn., February 1926. [Recd. July 1926.]

The dusting and spraying experiments begun in 1920 were continued. A method of tabulating results obtained on different varieties of apples, with several treatments of sprays, dusts, or a combination of both, and against a number of pests, is explained, and the results obtained during the year are recorded in this way. The materials used were the same as in the previous year [*R.A.E.*, A, xiii, 413], except that nicotine was omitted from the liquid spray. The results showed that a liquid spray used with a spreader gave the best effects. Treatment consisting of 3 liquid sprayings followed by 3 dustings was almost as successful as all liquid sprays, and, as it obviates danger of scorching the foliage, this should prove a very satisfactory combination.

Aphids infesting apples are *Toxoptera graminum*, Rond. (spring grain aphis), *Aphis pomi*, DeG. (green apple aphis) and *Anuraphis roseus*, Baker (rosy apple aphis). These hatch in the order named, and as *A. roseus* is the most important pest and does not usually hatch until the tips of the leaves are about ½ in. long, treatment should be delayed long enough to ensure all eggs having hatched. A proprietary spray oil, used in the delayed dormant period, was the most efficient remedy, lime-sulphur with nicotine also gave good results, but without the nicotine was almost useless. The susceptibility of different varieties of apple to Aphid attack is discussed.

Garman (P.). **The Oriental Peach Moth in 1925.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 280–286, 1 fig. New Haven, Conn., February 1926. [Recd. July 1926.]

Studies of the oriental peach moth [*Cydia molesta*, Busck] were continued from the previous year [*R.A.E.*, A, xiii, 414]. The first adult appeared on 5th May, and three generations occurred, with a partial fourth which began on 6th September. Whether many of the larvae of this generation reach maturity and hibernate has not been determined. Parasites reared from *C. molesta* were *Eubadizon* sp., which passes the winter in the cocoon of the host and emerges in spring; *Macrocentrus ancylivora*, Roh., fairly abundant during August; and *Glypta rufiscutellaris*, Walsh, of which only two individuals were obtained. None of the measures adopted in 1924 and 1925 reduced the amount of infested fruit below 10 per cent., but attempts are now being made to find a substance that will kill the larva before entering the fruit or provide a suitable coating upon which the larva would feed. Bait pans are being tried and are proving fairly successful [*R.A.E.*, A, xiii, 252]. The recommendations at present are nicotine sprays, cultivation before 5th May in order to bury the larvae 3 inches deep, treatment with paradichlorobenzene to destroy larvae hibernating on the trunk near the ground, and destruction or removal of dropped fruit. Four sprays containing nicotine sulphate gave as good results in 1925 as five applications in 1924. Injury resulted from using 4 lb. potash fish-oil soap in 50 U.S. gals. nicotine spray, though reducing the soap to 2 lb. obviated this, and also from sulphur and acid lead arsenate dusts containing 10 per cent. lead arsenate. Nicotine dust caused no damage, but cannot be used less than 3 weeks before picking time, as it is apt to cling to the fruit. Nicotine soap sprays have not this disadvantage, and nicotine sulphate can probably be added to a fungicide, such as self-boiled lime-sulphur or dry mix sulphur lime, without decreasing its effectiveness.

GARMAN (P.). **The Curculio Problem in Connecticut.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 286–291, 17 refs. New Haven, Conn., February 1926. [Recd. July 1926.]

The plum curculio [*Conotrachelus nenuphar*, Hbst.] is a serious pest of apples in Connecticut, and as much as 80 or 90 per cent. of the crop in some orchards is deformed or destroyed by it. Peaches rarely become infested as there is no second generation of larvae ; certain varieties of plum and cherries, apricots and nectarines are also liable to attack. Investigations have shown that the weevils begin to emerge from hibernation in Connecticut about 1st May (when most apple trees are in the pink bud stage) and are most abundant on the trees about 15th–20th May (when the blossoms have fallen) ; they are active throughout June, oviposition extending until the second week of July. Larvae develop abundantly in early dropped apples and begin to leave the fruit in late June, entering the soil about mid-July. Adults emerge from the soil by 1st August, are at their maximum about mid-August, and hibernate early in September.

The most common remedial measures are reviewed ; these include attention to dropped fruits, spring and early summer applications of arsenicals, and the treatment of wild apple trees or neglected orchards, which frequently cause re-infestation. The indications are that continued treatments year after year produce an increasing percentage of clean fruit.

GARMAN (P.). **Tests of Alcohol-Formalin for Control of American Foulbrood in Bees.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 291–292. New Haven, Conn., February 1926. [Recd. July 1926.]

Further experiments that are described confirm the successful treatment of combs containing American foulbrood with alcohol-formalin [*R.A.E.*, A, xiii, 415].

GARMAN (P.). **The Pear Psylla in Connecticut.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 292–295, 2 figs., 5 refs. New Haven, Conn., February 1926. [Recd. July 1926.]

Psylla pyricola (pear psylla) is by far the most important pest of pears in Connecticut. Its stages are described, and notes are given on the life-history, biology and control measures as worked out for New York State, where there are 3 or 4 generations. From data obtained from neighbouring States, a spray programme likely to be suitable for Connecticut is given.

WALDEN (B. H.). **Outbreak of Pea Aphid on Alfalfa.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 295–298. New Haven, Conn., February 1926. [Recd. July 1926.]

An unusual feature in Connecticut in 1925 was a severe infestation of lucerne fields by *Illinoia pisi*, Kalt. (pea aphis). Observations showed that the plants most seriously injured by the Aphids had previously been weakened by drought or winter conditions ; the most vigorous plants, though heavily infested, did not show much check in growth. Red clover, on which the winter is passed in the egg stage, and on which some of the Aphids pass the whole year, running through about 12 generations, can also withstand heavy infestations without noticeable injury. About 1st July in Connecticut, the majority of the Aphids migrate to peas. Many natural enemies were observed, the most destructive probably being the fungus, *Empusa aphidis*. Predacious Coccinellid and Syrphid larvae were present in many fields, and the Hymenopterous parasites, *Aphidius rosae*, Haliday (by far the most abundant), *Megorismus fletcheri*, Crawf., and *Lygocerus niger*, How., were reared.

WALDEN (B. H.). **Injury to Apples by the Red Banded Leaf-roller and its Control.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 298–301. New Haven, Conn., February 1926. [Recd. July 1926.]

Eulia velutinana (red banded leaf-roller) has done considerable damage to apples in Connecticut during the last few years, feeding on the surface of the fruit, generally where it has been in contact with a leaf or another fruit. The larvae work under a thin, whitish web and frequently continue their depredations during storage of the fruit, when the injuries also afford an entrance for rot-producing organisms. The life-history in Connecticut has not been worked out, but the winter is probably passed in the pupal stage. Experiments in 1922 indicated that sprays were somewhat more effective than dust treatments, and five applications were 1½ times as effectual as three. In 1925, the spray used was 6 lb. dry lime-sulphur and 3 lb. lead arsenate (dry), with and without the addition of 1 lb. calcium caseinate, in 100 U.S. gals. water ; also a dust containing 90 lb. dusting sulphur to 10 lb. lead arsenate. Five applications of the spray gave the best results, though combination treatments ending with a spray in late July were almost as successful. It is evident that orchards must be sprayed later than the general practice to control this pest.

WALDEN (B. H.). **The Raspberry Fruit Worm,** *Byturus unicolor*, **Say, injuring Strawberry Blossoms.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, p. 302. New Haven, Conn., February 1926. [Recd. July 1926.]

Adults of *Byturus unicolor*, Say (raspberry fruit worm) are recorded as feeding on the blossoms of a late variety of strawberries, in a field where no raspberries were present, but which was near a field from which infested raspberries had been removed in the spring. The beetles had evidently wintered in the soil and attacked the strawberry plants in default of raspberries. This is the first record of their attacking strawberries. They soon disappeared, however, and there is no indication of their being able to develop on this plant.

ZAPPE (M. P.). **The European Corn Borer in Connecticut,** *Pyrausta nubilalis,* **Hb.**—*Connecticut Agric. Expt. Sta.,* Bull. 275, pp. 303–308. New Haven, Conn., February 1926. [Recd. July 1926.]

The history of this insect in Connecticut is outlined. Scouting in 1925 revealed the presence of the borer in 20 separate infestations in five towns, and the situation in each of these is discussed.

BRITTON (W. E.) & ZAPPE (M. P.). **Further Notes on the Asiatic Beetle,** *Anomala orientalis,* **Waterhouse.**—*Connecticut Agric. Expt. Sta.,* Bull. 275, pp. 309–312, 2 figs. New Haven, Conn., February 1926. [Recd. July 1926.]

During the later summer of 1925, more injury to lawns by *Anomala orientalis,* Waterh., was observed in the infested area of New Haven than in any previous year, and if this beetle should continue to spread southward it would be a serious pest to many crops. An attempt is to be made to eradicate it by treating the whole of the infested area with carbon bisulphide emulsion to kill the larvae in the soil. It is still thought that there is an annual generation, though some of the larvae continue over until the second season. Various treatments with calcium cyanide are described, all of which did a certain amount of damage to the grass, but cyanogas grade G [a coarse dust containing 40–50 °/₀ calcium cyanide], at the rate of 1, 2, 3 and 4 oz. per square yard, killed all the larvae present, with only slight injury to the grass. Home-made carbon bisulphide emulsions proved ineffective.

ZAPPE (M. P.). **Miscellaneous Insect Notes.**—*Connecticut Agric. Expt. Sta.,* Bull. 275, pp. 321–327, 2 figs. New Haven, Conn., February 1926. [Recd. July 1926.]

Miscellaneous pests recorded are: the Coccid, *Eriococcus borealis,* Ckll., on *Spiraea salicifolia*; the Cerambycid, *Neoclytus acuminatus,* F., causing a twig gall on birch; the lacebug, *Corythucha ulmi,* Osb. & Drake, on elm foliage; *Diestrammena japonica,* Blatchley (*marmorata,* DeHaan), found in a greenhouse in Connecticut for the first time; a borer, apparently *Janus abbreviatus,* Say, in willow twigs; *Eriophyes pini,* Nal. (European pine mite) on conifers; the larvae of *Agrotis unicolor,* Wlk., and *A. fennica,* Tausch., eating the buds and bark of young apple trees, the latter being parasitised by the Tachinid, *Phorocera claripennis,* Macq.; and *Conotrachelus crataegi,* Walsh (quince curculio) on pears.

Agrilus viridis var. *fagi,* Ratz. (rose stem girdler) attacked *Rosa rugosa,* and also, apparently, *R. hugonis.* The adult deposits single eggs on the bark in June and July, and the young larva enters the sapwood, and makes spiral tunnels round the stem. The larval period is said to occupy 2 years, and pupation occurs in the stem from 3 to 6 inches above the swelling. The beetles are known to attack birch, beech, alder, oak and poplar. The only remedy known is to cut and burn the infested stems in winter or spring before the beetles emerge. The Tipulid, *Nephrotoma ferruginea*, F., injured tobacco plants near the surface of the ground. Eggs of the Syrphid fly, *Syrphus torvus*, O.S., were found in numbers laid on young unfolding apple leaves, particularly near Aphid colonies, on which the larvae feed.

BAILEY (E. M.). **Report on Commercial Insecticides and Fungicides, 1925.**—*Connecticut Agric. Expt. Sta.*, Bull. 272, pp. 143–150+i—iv. New Haven, Conn., December 1925. [Recd. July 1926.]

The analyses of insecticides and fungicides made during the year are recorded, and an index to analyses previous to 1925 is given.

BRITTON (W. E.) & ANDERSON (P. J.). **Tobacco Insects observed in Connecticut in 1925.**—*Connecticut Agric. Expt. Sta.*, Tobacco Sta. Bull. 6, pp. 74 T–93 T, 16 figs. New Haven, Conn., March 1926. [Recd. July 1926.]

The injury to tobacco in Connecticut by *Pheletes* (*Limonius*) *agonus*, Say, and other wireworms in 1925 is described [*R.A.E.*, A, xiv, 440]. Tests with cyanogas calcium cyanide have shown it to be highly toxic to wireworms and to kill them even through several inches of soil, though tobacco plants when placed in direct contact, or even near the cyanide in the soil, are killed in a few hours. Cyanide may be drilled into the soil at the rate of 100 lb. per acre, and the plants can then be set within a week, or possibly sooner, without suffering any injury. This treatment has no effect on the quality of the cured leaf.

Damage was also done to tobacco plants by cutworms, chiefly the larvae of *Agrotis ypsilon*, Rott. ; these can be controlled by a poison bait containing Paris green, which for preference should be broadcast before setting ; and by the flea-beetle, *Epitrix cucumeris*, Harr. The worst damage by the latter was done in fields adjacent to potatoes, from which the beetles migrated after the potato tops died. The remedies suggested are sprays of Bordeaux mixture and lead arsenate, dipping the plants, root and leaf, before setting, in 1 lb. lead arsenate to 10 U.S. gals. of water, and spraying with 2 teaspoonsful of nicotine sulphate 40 per cent. in 1 U.S. gal. water with a little soap in it. Minor pests are *Smynthurus hortensis*, Fitch (garden springtail), which attacks the young seedlings ; *Phorbia* (*Hylemyia*) *cilicrura*, Rond. (seed corn maggot), which is only occasionally found tunnelling in tobacco ; a cranefly, *Nephrotoma ferruginea*, F. ; and the tobacco hornworms, *Protoparce* (*Phlegethontius*) *quinquemaculata*, Haw., and *P. sexta*, Joh. It is uncertain whether more than one generation of these hawk-moths occurs annually in Connecticut ; hand collection and spraying and dusting with lead arsenate are the remedies practised.

GRANOVSKY (A. A.). **Studies on Leafhopper injury to Apple Leaves.**—*Phytopathology*, xvi, no. 6, pp. 413–422, 1 pl., 19 refs. Lancaster, Pa., June 1926.

This paper in a briefer form has already been noticed [*R.A.E.*, A, xiv, 165].

PAYNE (N. M.). **The Effect of environmental Temperatures upon Insect Freezing Points.**—*Ecology*, vii, no. 1, pp. 99–106, 2 graphs, 13 refs. Brooklyn, N.Y., January 1926.

The results are given of experiments by the thermoelectric method to determine the effect of various temperatures on the freezing point of insects. The latter was found to vary with the seasons, but though the resistance to cold is periodical, it can be artifically broken up by exposure to suitable temperatures, humidity, etc.

BESLEY (F. W.). **Forest Research under State Auspices.**—*Reprint & Circ. Ser. Nat. Res. Council*, no. 70, 10 pp. Washington, D.C., April 1926.

In the course of this revision of forest research work in the United States, it is stated that insects and tree diseases cause a loss of over £20,000 annually. For the past several years, the fir and spruce forests of Maine have been damaged to an enormous extent by the spruce bud worm [*Tortrix fumiferana*], but practical methods of control have now been worked out that may result in a large saving to the forest industries of the State.

PLAKIDAS (A. G.). **Strawberry "yellows," a degeneration Disease of the Strawberry.**—*Phytopathology*, xvi, no. 6, pp. 423–426, 1 fig., 2 refs. Lancaster, Pa., June 1926.

A summary of the information contained in this paper has been previously noticed [*R.A.E.*, A, xiv, 62].

PETERSON (A.). U.S. Bur. Ent. **Additional Information on Baits attractive to the Oriental Peach Moth,** *Laspeyresia molesta* **Busck, 1925.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 429–439, 5 figs. Geneva, N.Y., June 1926.

The results are given of further experiments with baits [*R.A.E.*, A, xiii, 252] for *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental peach moth). The bait was placed in pans in the orchards and consisted of one part molasses diluted with ten parts water; one cake of yeast was thoroughly mixed with enough bait for ten pans, but subsequent experiments showed this to be unnecessary as natural fermentation is more lasting.

Adults of *C. molesta* were caught in peach orchards throughout the season, from the middle of April to the middle of October, there being no period during that time when they were entirely absent, indicating that the emergence periods of the different broods overlap. Moderate or large numbers of adults of the spring brood were captured in all the orchards between 15th April and 25th May, and large numbers of first brood adults were captured in the peach orchards from 10th June to 2nd July, when more were obtained than at any other period; the number of first brood adults captured in the quince and apple orchards at this time was small, although the fruit in the quince orchard was heavily infested late in the season. In July and August, in which months the largest number of adults had been taken at New Brunswick in the previous year, there was a marked reduction in the numbers captured, although there was a slight increase in September.

The decrease in the numbers of adults captured in July and August is thought to have been due to parasitism of the larvae. The most important parasite was *Macrocentrus* sp. During August and September, an egg parasite, *Trichogramma minutum*, Riley, was abundant, occurring sometimes in 60 per cent. of the eggs collected.

Various types of containers for baits were tested, but none was found to be so efficient as an open pail or pan ; in most cases more moths were caught in enamelled pans than in pails, and many more moths were caught in the latter when two-thirds or three-fourths filled than when one-third or one-fourth filled. The pails placed highest in the trees captured the greatest number of moths.

HEADLEE (T. J.). **The Regulation of the Movement of Fruit and Nursery Stock in Relation to the Distribution of the Oriental Fruit Moth** (*Laspeyresia molesta* **Busck**).—*Jl. Econ. Ent.*, xix, no. 3, pp. 440–441. Geneva, N.Y., June 1926.

In view of the large number of ways in which it is possible for *Cydia* (*Laspeyresia*) *molesta*, Busck, to be carried to uninfested territory, as larvae in peach nursery stock or in peaches, as larvae or pupae in packing materials and containers for peaches, or as adults by flight, assisted by wind, the author does not consider that regulations prohibiting the movement of peaches and peach nursery stock from infested to uninfested territory or expenditure on inspecting them would be justified by the results. He considers that more would be gained by experiments to discover satisfactory control methods.

FROST (S. W.). **Bait-pails as a Possible Control for the Oriental Fruit Moth.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 441–450, 5 charts, 1 ref. Geneva, N.Y., June 1926.

In a quince orchard in Pennsylvania infested with *Cydia molesta*, the bait pails used had a capacity of about 1 gal., and they were filled half full with a mixture of one part molasses and eight parts water, containing 1 oz. sodium arsenite per U.S. gal. This bait gave good results, but develops a dense growth of mould if undisturbed. Molasses and water baits, which ferment without the addition of yeast, are considered to be the best for field conditions, but their period of maximum attraction is short.

Fermenting molasses baits were studied under laboratory conditions. The evolution of hydrogen and carbon dioxide and the production of alcohol are simultaneous, and last only from one to five days, sometimes reaching their maximum in 24 hours ; during this time, the alcohol is probably the chief agent in attracting adults of *C. molesta*. Acid production begins soon after the evolution of gas has ceased and lasts for 50 or 60 days or longer, during which time the bait continues to be attractive ; it is therefore evident that the acid is also an attractant. Certain antiseptics such as formalin and sodium salts arrest the fermentation process for a considerable time, and non-fermenting baits are more attractive than fermenting ones, but their use is not at present practicable under orchard conditions.

The two sexes of *C. molesta* are attracted to baits in almost equal numbers, and the females mostly feed before oviposition. When the ovaries of females caught in bait traps were examined, of 113 individuals only 13 had laid all of their eggs, and 51 had not laid any. It is not known whether the moths ever succeed in feeding at a bait trap and escaping from it.

SNAPP (O. I.). U.S. Bur. Ent. **Airplane Dusting of Peach Orchards.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 450–459, 11 refs. Geneva, N.Y., June 1926.

The following is taken from the author's abstract and conclusions: Aeroplanes equipped for dusting cotton with calcium arsenate will distribute the heavy sulphur, lead arsenate and lime peach dust in a uniform and satisfactory manner, if the agitation in the hopper is doubled and the rate of discharge of the dust reduced about one-half; the 80 : 5 : 15 sulphur, lead arsenate and lime dust should be applied at the rate of about $\frac{1}{4}$ lb. per tree, and the 5 : 95 lead arsenate and lime dust at the rate of about $\frac{1}{5}$ lb. per tree; to get these dosages from an aeroplane, the dust swath widths should be about 60 feet with the outlet valve half open for the first dust and three-quarters open for the second. About 1,000 acres of peach orchards were dusted from aeroplanes in Georgia in 1925, and under the conditions then existing the quality of the fruit from these orchards equalled that of fruit from orchards dusted by ground machines. The aeroplanes flew from 10 to 20 feet above the trees at a speed of about 85 miles per hour, and dusted about 5,000 trees per hour. Examinations of dropped and harvested fruit showed that aeroplane dusting was just as effective as ground machine dusting in controlling the peach curculio [*Conotrachelus nenuphar*, Hbst.], and colorimetric tests [*R.A.E.*, A, xiii, 427] showed that lead arsenate in the dust mixtures was distributed somewhat better over the foliage by an aeroplane than by a ground dusting machine. Before the efficacy of aeroplane dusting of peach orchards can be definitely established, further experiments under varying conditions of weather and infestation will be necessary.

WAKELAND (C.). **Control of the Snowy Tree Cricket in Prune Orchards.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 460–466, 1 ref. Geneva, N.Y., June 1926.

Oecanthus niveus, DeG. (snowy tree cricket) has been known as a pest of prunes in south-western Idaho since 1910, but was only injurious in one locality; in 1923 it caused serious injury in many orchards in the prune-growing areas of south-western Idaho and south-eastern Oregon. The nymphs and adults puncture the skin of ripening prunes and feed on the interior, destroying them or making them unfit for sale as fresh fruit.

The eggs are laid in the thick, corky bark on the under sides of the larger branches from August to October or November. Most of them hatch in late May and early June, and the nymphs feed in the evening and early morning on the upper surfaces of the leaves in the latter part of July or early August, and conceal themselves among the leaves during the day. The adults appear in August.

In 1924 dusting and spraying experiments were carried out in a large orchard at the time when the crickets were still mostly feeding on the leaves. The following insecticides were applied on various plots: single and double applications of undiluted calcium arsenate dust; 50 per cent. calcium arsenate and 50 per cent. hydrated lime dust mixture; 20

per cent. calcium arsenate and 80 per cent. hydrated lime dust mixture ; 8 lb. lead arsenate in 200 U.S. gals. water ; 4 lb. lead arsenate in 200 U.S. gals. water. On all the treated plots the injured fruit harvested amounted to less than 1 per cent., while on the untreated plot it was 8·27 per cent.

The cost of dusting 100 trees with undiluted calcium arsenate was about 10s., and the cost of spraying with 4 lb. lead arsenate to 200 U.S. gals. water about 18s., but the choice of method is influenced by the availability of apparatus and the area to be treated. Owing to the slow multiplication of *O. niveus* control measures should only be necessary at intervals of several years. Examinations of eggs in the bark of prune trees in the spring of 1925 showed that only 0·9 per cent. had survived the severe frosts of the previous December.

PHIPPS (C. R.). *Xanthonia decemnotata* **Say, an Apple Pest in Maine (Coleoptera, Chrysomelidae).**—*Jl. Econ. Ent.*, xix, no. 3, pp. 466–469, 1 pl., 9 refs. Geneva, N.Y., June 1926.

Injury to apples in an orchard in Maine has been found to be caused by the feeding of the adults of *Xanthonia decemnotata*, Say. The damage has occurred for 16 years, but has only recently assumed serious proportions ; in 1925 from 75 to 90 per cent. of the russet apples in the orchard in question were injured, and other varieties to a smaller extent. Damage to apples occurs only from the middle of September to the beginning of October, so that the beetles, which are stated to occur from April to October, must migrate to apples from other food-plants. They were found in curled up dry leaves during the day, and, in captivity, fed at night. The recorded food-plants of *X. decemnotata* are oak, beech and elm ; in captivity the beetles also fed on the leaves of *Tilia americana* and *Rubus strigosus*. This species has been found in Canada, the eastern United States, and Texas, but has not been recorded previously as an apple pest. The larvae are probably root feeders.

DELONG (D. M.). **A New and Important Species of Leafhopper injuring Apple in Ohio.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 469–470, 1 fig. Geneva, N.Y., June 1926.

Typhlocyba (*Empoa*) *malini*, sp. n., is described from specimens from apple in central Ohio, and the differences between it and *T.* (*E.*) *rosae*, L., with which it has apparently been confused, are given. *T. malini* is the commonest leafhopper on apple in the district, and besides the injury that it causes by feeding on the leaves, it reduces the value of the fruit by secreting a substance resembling honey-dew.

HEADLEE (T. J.) & ILG (C.). **Some Facts relative to the Raspberry Crown Borer** (*Bembecia marginata*).—*Jl. Econ. Ent.*, xix, no. 3, pp. 471–477, 1 fig., 2 refs. Geneva, N.Y., June 1926.

Pennisetia (*Bembecia*) *marginata*, Harr. (raspberry crown borer) has been very injurious to red raspberries in New Jersey, very few canes being uninjured over several thousand acres. The life-history of this moth is briefly described ; it has been stated by others [*cf. R.A.E.*, A, ix, 166] that the life-cycle extends over two years, but all the larvae observed by the authors pupated in the latter part of August and the first part of September, although they varied in size.

Treatment of the soil around the raspberry plants with granular calcium cyanide did not kill advanced stage larvae of *P. marginata* except at strengths injurious to the plants. Carbon bisulphide emulsion, consisting of 10 parts carbon bisulphide emulsified in 3 parts water and 1 part resin fish-oil soap (by volume) was more effective in killing the larvae when applied to the surface of the earth than in a furrow ; this emulsion killed advanced stage larvae at strengths apparently harmless to the plants (0·9 and 0·3 liq. oz. carbon bisulphide per plant), but did not affect the pupae at the latter strength. Applied at the strength of 0·156 liq. oz. carbon bisulphide per plant in October, the emulsion killed all young larvae but injured new shoots that were beginning to grow. Tobacco dust, 1 lb. of 70–90 mesh containing 1·97 per cent. nicotine sifted over the crown of a raspberry plant and the soil surrounding it, followed by an application of 1 U.S. gal. water, killed the advanced stage larvae without injuring the plant. The results of experiments with tobacco dust applied to raspberry plants in October for the control of the young larvae are given. From these it is concluded that the percentage of larvae killed varies with the amount of nicotine applied, the fineness of the tobacco dust, and the rate of evolution of nicotine gas. The addition of water after applying tobacco dust greatly increases its efficiency, and the use of 50 per cent. tobacco dust with 49 per cent. hydrated lime and 1 per cent. sodium carbonate greatly increases the rate of evolution of gas, provided that the mixture is moistened after application. Tobacco dust, even in large amounts, does not injure young shoots.

SEVERIN (H. H. P.) & SCHWING (E. A.). **The 1925 Outbreak of the Beet Leafhopper** (*Eutettix tenella* **Baker**) **in California.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 478–483, 2 refs. Geneva, N.Y., June 1926.

This paper describes further investigations on the bionomics of *Eutettix tenella*, Baker (beet leafhopper) on the same lines as others previously noticed [*R.A.E.*, A, vii, 474 ; xi, 81 ; xii, 80; xiii, 48, 630]. The spring flights of leafhoppers from the plains and foot-hills to the beet fields in the valleys are discussed ; in two cases these flights took place earlier than in any year recorded, beginning at the end of March, probably owing to the drying of the pasture vegetation due to low rainfall. In the San Joaquin valley, large numbers of *E. tenella* were found on Russian thistle (*Salsola kali* var. *tenuifolia*) and saltbushes [*Atriplex*] after the pasture vegetation became dry ; subsequently rain fell and the red stem filaree plants (*Erodium cicutarium*) became green again, and spring brood males and females and a few second brood nymphs were found on them at the end of May. In the Salinas valley a partial second brood developed in the foot-hills and attacked late planted beets in the fog belt, causing serious curly-leaf injury. During the summer large numbers of nymphs and adults were found on Australian saltbush (*Atriplex semibaccata*), so that it is evident that the leafhoppers do not all leave the foot-hills when the pasture vegetation becomes dry. In the Sacramento valley summer brood adults flew at least three miles from beet fields planted from March to May to others planted in June.

In the fog belt, where curly-leaf disease is not usually severe, except in years when *E. tenella* is unusually abundant, the increase of *Heterodera schachtii*, Schmidt (beet nematode) has caused a serious reduction in the yield of sugar beets.

SWEETMAN (H. L.). **Results of Life History Studies of** *Diabrotica 12-punctata* **Fabr. (Chrysomelidae, Coleoptera).**—*Jl. Econ. Ent.*, xix, no. 3, pp. 484–490, 1 fig., 6 refs. Geneva, N.Y., June 1926.

In Iowa *Diabrotica duodecimpunctata*, F. (12-spotted cucumber beetle) is not, by itself, a serious pest of either maize or cucurbits; in conjunction with *D. vittata*, F. (striped cucumber beetle), however, it causes considerable damage to the latter, and it is an important pest of both crops in other parts of the United States. Seventeen females, taken in the last half of June and the first week of July, laid an average of 360 eggs each, almost all being laid by the end of July. The eggs hatched in from 6 to 13 days, and the larvae fed for about three weeks, moulting twice, and then constructed earthen cells in the top three inches of soil, where they spent a pre-pupal period of 5 or 6 days. The pupal period lasted 5–9 days, and the adults remained in the pupal cell 2 days before emerging. The average time of the development from oviposition to the emergence of the adult was about 46 days.

In the field most of the adults emerged in July and August, and mating took place in the late summer and autumn; there is apparently only one generation a year in Iowa, and it is most probable that the beetles hibernate as adults and lay their eggs the following year. It is possible, however, that hibernation in other stages may occur.

In the autumn of 1923 large numbers of beetles were present on cucurbits until the latter were killed by frost, when they migrated to maize, on which they fed until late November. In the spring of 1924, however, very few beetles were seen, and little damage was caused by them to cucurbit seedlings. The larvae feed in the stems and roots of cucurbits, but the adults feed above ground only, and probably cause more loss by transmitting bacterial wilt, *Bacillus tracheiphilus* [*R.A.E.*, A, iv, 385; viii, 422], than by actual damage to the tissues.

No important parasite of *D. duodecimpunctata* was found; only seven larvae and three adults of the Tachinid, *Celatoria diabroticae*, Shim., were obtained from several hundred beetles collected in the autumn.

CHANDLER (S. C.). **The Economic Importance of the Carrot Weevil in Illinois.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 490–494, 1 fig. Geneva, N.Y., June 1926.

In south-western Illinois, where carrots are extensively grown, serious injury to this crop is caused by *Listronotus latiusculus*, Boh. (carrot weevil), the larvae of which feed on the upper part of the root of carrots, and, to a less extent, of parsley. In many gardens 60 per cent. of the carrots were infested. *L. rudipennis*, Blatchley, was reared from carrots from one locality. *L. latiusculus* has apparently only one generation a year in Illinois; the adults have been taken as early as June, but appear chiefly in July and August; they have been found hibernating in frozen carrot tops and under leaves.

A weevil bred from *Sagittaria variabilis* in Ohio by C. M. Weed closely resembles *L. latiusculus* (under which name it was recorded), but is probably a distinct species.

HARRIS (H. M.). **A New Carrot Pest, with Notes on its Life History.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 494–496, 1 pl. Geneva, N.Y., June 1926.

The weevil, *Listronotus rudipennis*, Blatchley, has been found to be causing serious injury to carrots in Iowa, in some cases rendering

90 per cent. of the crop unfit for human consumption. The adults feed on any part of the carrot plant; they possess well-developed wings, but were not observed to fly. The eggs are laid in cavities eaten out by the female in the base of the leaf-stalks or in the crown of the root, an average of five being laid in each cavity; the female secretes a black sticky substance over the eggs, which hardens and seals the cavity. One female observed laid 546 eggs in 30 days, and this was not the whole of its oviposition period. The eggs hatch in 5–7 days, and the larvae feed for about 21 days in the roots, tunnelling chiefly near their surface, and moulting three times; the full-fed larvae rest for about a day, construct an earthen cell, and rest for another day before pupating; the average lengths of the larval instars are 4, 3, 3 and 9 days. The pupal stage lasts from 4 to 10 days, and the adults emerge a few hours after casting the pupal skins. The average time from oviposition to the emergence of the adult is about 31 days. In captivity the adults fed for 10–12 days before the females began to oviposit. There are probably three generations, with continuous breeding throughout the summer; hibernation apparently takes place in the adult stage.

WEIGEL (C. A.). U.S. Bur. Ent. **Observations on the Life History of the Narcissus or Daffodil Fly,** *Merodon equestris* **Fab.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 497–501, 1 ref. Geneva, N.Y., June 1926.

Since a regulation [*R.A.E.*, A, xiv, 162] prohibited the importation of bulbs of *Narcissus* into the United States, the increased importance of bulb growing has made a knowledge of the life-history and control of the various pests of bulbs that have been introduced into the country desirable.

Bulbs of *Narcissus* containing nearly full-grown larvae of *Merodon equestris*, F. (narcissus fly) were obtained from the Pacific Coast in August, and the life-history of the fly was studied at Washington, D.C., under conditions as nearly normal as possible. The methods employed are described. The larvae passed the winter in the bulbs, and in April or May (or earlier under greenhouse conditions) burrowed through the tops of the bulbs to the surface of the soil, where they pupated, with the head end of the pupa and breathing spiracles exposed. The first pupa was seen on 9th April in the open, and flies emerged from 24th April to 4th June, and lived from 4 to 17 days. Sunlight appeared to be necessary for mating and oviposition. Eggs were laid on the bulbs, among the outer scales, or on the green or dry leaves close to them, and hatched in from 2 to 9 days; a larva was observed to work its way down the side of the bulb, and apparently entered it at the base. The larvae were full-grown by November, at which time they were sluggish, and they probably did not feed much in the winter. The seasonal development of *M. equestris* as recorded above is substantially the same as in England and Holland.

FENTON (F. A.). **Observations on the Biology of** *Melanotus communis* **and** *Melanotus pilosus*.—*Jl. Econ. Ent.*, xix, no. 3, pp. 502–504. Geneva, N.Y., June 1926.

Two of the commonest species of wireworms in wet land in Iowa are *Melanotus communis*, Gyll., and *M. pilosus*, Blatch. They are frequently injurious to young maize plants, especially in heavy loam that has recently been broken up. Larvae collected in May and June

1921 fed slowly for three years, moulting once or twice a year ; from a comparison of their size in 1921 and 1923 with that of larvae in their first year and full-grown larvae it is assumed that they were three years old in 1921, and that they pupated in 1924, making an estimated period of at least six years from the hatching of the egg to pupation. Eggs were laid singly in the soil at a depth of 1–2 inches in June, and perhaps July, and mostly hatched early in July ; the larvae grew very slowly and moulted once before passing the first winter. In late June and early July mature larvae constructed oval cells in the soil, and after a resting period, pupated, between 7th July and 29th August, mostly in August. The pupal period of *M. communis* ranged from 7 to 39 days, with an average of 18 days, that of *M. pilosus* from 7 to 19 days with an average of 14 days. Most of the adults emerged in August ; they were confined in cages and passed the winter in the pupal cells, becoming active at the end of May. It is probable that in nature they hibernate in sheltered situations above ground, as numbers have been found under loose bark of trees in spring and as late as 2nd June. They were not observed to eat leaves, but fed readily on pollen.

STRAND (A. L.). **Preliminary Experiments on the Use of Chlorpicrin as an Insect Fumigant in Flour and Cereal Mills.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 504–510, 1 pl., 3 refs. Geneva, N.Y., June 1926.

In experiments in which *Tribolium confusum*, Duv. (confused flour beetle) was used as a basis of comparison, it was found that 1 lb. chloropicrin at 20° C. [68° F.] is equal in toxicity for insects to 10 lb. carbon bisulphide or 80 lb. carbon tetrachloride. In view of its high toxicity and non-inflammable and non-explosive properties, it was thought that it should prove useful for fumigating mills, without danger to persons working in them.

The following is taken from the author's abstract and conclusions : Chloropicrin, when vaporised within the milling equipment of flour and cereal mills, is a very effective fumigant for controlling *Ephestia kühniella*, Zell. (Mediterranean flour moth). It is less effective against *T. confusum*, but several periodic fumigations have resulted in a very excellent control of this beetle in a mill formerly heavily infested. The liquid chloropicrin, diluted with an equal volume of carbon tetrachloride, is best applied within the milling equipment by vaporising the fumigant in the elevator heads while the machinery is running. It is this use of the fumigant within the machines and elevator legs without risk of fire and serious personal danger that constitutes its greatest advantage. Small amounts of it can be used to destroy infestations in conveyors, bins, or pieces of idle equipment without interfering with the normal operation of the mill. Methods of application have been found that make the wearing of a gas-mask unnecessary. The preliminary experiments indicate plainly that frequent fumigations with chloropicrin will keep mill-infesting insects down to minimum numbers and greatly increase the intervals at which general fumigations are necessary.

FLEMING (W. E.). **Ortho-toluidine as a Contact Insecticide.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 511–515, 4 refs. Geneva, N.Y., June 1926.

Emulsions of orthotoluidine, an amino derivative of toluene, of different strengths were made by mixing varying amounts from 2·396 to 35·94 gm. with 1 litre (1 to 15 lb. to 50 U.S. gals.) of alcoholic potassium oleate solution, containing 6 lb. potassium oleate per 50 U.S. gals. The toxicity of the spray was tested by applying it directly to adult Japanese beetles (*Popillia japonica*, Newm.) ; an average mortality of 95 per cent. was obtained with spray containing 23·96 gm. orthotoluidine per litre (10 lb. in 50 U.S. gals.) after four days, but an average mortality of 83 per cent. occurred in the same time among beetles sprayed with the potassium oleate solution alone, and an average mortality of 37 per cent. among unsprayed beetles ; the corresponding figures after 24 hours were 86, 33, and 4, so that it is evident that orthotoluidine is of considerable value even against insects so heavily chitinised as the adults of *P. japonica*. Dilute solutions might be effective against Aphids and other soft-bodied insects.

CAMPBELL (F. L.). **On the Possibility of Development of Tolerance to Arsenic by Individual Insects.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 516–522, 9 refs. Geneva, N.Y., June 1926.

It has been suggested that individual insects could develop partial immunity from the effects of arsenic as a result of taking a number of sub-lethal doses, and the object of the experiments described in this paper was to obtain evidence bearing on this theory. By means of a technique previously described [*R.A.E.*, A, xiv, 281], the author, experimenting with silkworms (*Bombyx mori*, L.), was able to administer known doses of neutral sodium arsenate solution. Silkworms that had received four sub-lethal doses were not found to be any more resistant to the effects of a final sub-lethal dose than others that had not previously received doses, as shown by subsequent rate of gain in weight. The fact that it is more difficult to kill older caterpillars than younger ones cannot be ascribed to the development of tolerance to arsenic, but is probably accounted for by an increase of the minimum lethal dosage per unit weight of insect that occurs during the larval period.

Although these experiments do not absolutely disprove the theory of acquired tolerance to arsenic in individual insects, the author considers it extremely unlikely that such tolerance could ever have an economic significance. This does not, however, affect the question of racial resistance to insecticides developed by natural selection.

GRIFFIN (E. L.) & RICHARDSON (C. H.), U.S. Bur. Ent. **A Field Method for Determining the Oil Strength of Sprays.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 522–525, 2 refs. Geneva, N.Y., June 1926.

The following is the authors' abstract of this paper : The Babcock method for the determination of butter-fat in milk and cream is modified to give the percentage by volume of oil in concentrated and spray-strength petroleum oil emulsions. The modified method is adaptable to emulsions containing soap, cresol, glue and probably other organic emulsifying agents, and can be used during spraying operations in the field. It is simple and can be used by non-technical men.

RICHARDSON (C. H.), U.S. Bur. Ent., & GRIFFIN (E. L.). **Modifications of Methods for Making Cold-mixed Oil Emulsions.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 525–529, 2 refs. Geneva, N.Y., June 1926.

The emulsion here described is similar to, and is made in the same way as, the cold-mixed emulsion devised by Whitcomb [*R.A.E.*, A, xiii, 258], but cresylic acid takes the place of amyl alcohol (fusel oil), which is more expensive and difficult to obtain. Cresol, U.S.P., cyclohexanol and cresylic acid were all found to be satisfactory substitutes for amyl alcohol, but the last-named is the most economical. The formula is 2 gals. lubricating oil, 1 qt. potassium fish oil soap (1 U.S. qt.=about 2 lb.) and ½ pt. crude cresylic acid ; the resulting paste contains about 86 per cent. oil, by volume, and may be stored for a long time without deteriorating, or 5 pints of water may be stirred slowly into it to form a stock emulsion, which contains about 68 per cent. of oil. If the water is not added at the time that the mixture is made, it should be added before it is placed in a spray tank. When diluted to spray strength, this emulsion has the stability and small oil droplets characteristic of a miscible oil and is relatively resistant to breaking down in hard water. Any petroleum oil from kerosene to lubricating oil of high viscosity can be used in its preparation.

A good cold-mixed lubricating oil emulsion can also be prepared by using the above formula without the cresylic acid, the method of manufacture being the same. The paste may be stored in air-tight containers for some time before being used, or a concentrated emulsion, containing about 67 per cent. oil, may be made by adding 3 quarts of water. If soft water is available, a smaller quantity of soap can be used, but not less than 1 pint ; the quantity of soap can be increased for use with hard water, but in the latter case the addition of a stabiliser will probably be more economical. This emulsion is as stable as the Government formula boiled emulsion, and is cheaper to make.

BRITTON (W. E.). **Three Injurious Insects recently introduced into Connecticut.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 540–545, 4 refs. Geneva, N.Y., June 1926.

During the latter part of 1925 *Anomala orientalis*, Waterh. (Asiatic beetle) was more injurious to lawns in New Haven than it had been previously. The adults appear in July, and the eggs are laid in the soil and hatch in a few days ; the larvae feed on grass roots within an inch of the surface until late in October, by which time they are about half-grown, when they burrow deeper into the soil for the winter. In the spring they come up close to the surface again and resume feeding, pupating in cells in the earth in June ; the larvae occasionally feed for two years before pupating, but normally there is one generation a year.

The larvae of a European sawfly, *Fenusa pumila*, Klug, have been found mining the young leaves, chiefly of new shoots and seedlings, of grey birch (*Betula populifolia*) and paper birch (*B. papyrifera*) in various places in Connecticut since 1923, when it was first discovered. It is probable that there are three complete generations and a partial fourth in a year. The eggs are laid in the leaves and hatch in about 10 days ; the larvae feed, on the average, for 11–12 days, making mines of the " blotch " type, and pupate in the ground. *F. pumila* has now been found in Rhode Island, Massachusetts, eastern New York, and Vermont.

Swellings in stems of *Rosa rugosa* and *R. hugonis* from one district of Connecticut were almost certainly caused by *Agrilus viridis* var. *fagi*, Ratz., a European beetle previously found in New Jersey [*R.A.E.*, A, iv, 198 ; ix, 434 ; xiv, 444].

McIndoo (N. E.). U.S. Bur. Ent. **An Insect Olfactometer.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 545–571, 8 figs. Geneva, N.Y., June 1926.

The following is taken from the author's abstract of this paper: The insect olfactometer consists of a specially constructed Y-tube through which insects pass from a dark chamber, being attracted by a light suspended near the free ends of the forks of this tube. The dark chamber is attached to the base of the Y-tube, while a suction apparatus to draw odours through the forks is attached at the point where the base and forks unite. The principle involved is to attract the insects equally toward the entrances of the forks by the light stimulus, but when ready to enter these forks, they are influenced unequally by the odours drawn through them, one fork serving as the attractive or repellent side and the other as the control side. The whole apparatus is so constructed and manipulated that the interfering factors are practically controlled, leaving only the olfactory responses to be recorded.

It seems that, so far as the insects are concerned, the key to success in work of this kind depends upon the proper physiological state of the species that is being tested. The proper state, perhaps, includes many factors, but particularly the proper age and sexual condition, and hunger when food odours are being used.

In this investigation it was shown by a large series of experiments that potato beetles (*Leptinotarsa decemlineata*, Say) can be induced to respond to their food odours by subjecting them to the odours from water extracts and steam distillates of their food-plants, and it was further shown by another large series of experiments that these insects can be induced to respond to the emanations from their living food-plants, giving experimental proof for the first time that plants attract insects by emitting odours. Emanations drawn through the apparatus from living potato plants could not be detected by the author, but in every one of 24 experiments the potato beetles gave attractive responses, the highest percentage being 76·7 per cent.

After aerating the steam distillates of potato foliage, potato tubers, horsenettle (*Solanum carolinense*), henbane (*Hyoscyamus niger*) and tomato plants for some time, the odours from all of them became attractive to the beetles, and the author could detect a common odour among them. Since all these plants belong to the family Solanaceae, it would be interesting to know whether they possess a particular constituent that emits this common odour; a knowledge of the nature of such a constituent might be useful in devising baits or traps for potato beetles.

Morrill (A. W.). **A Bollworm infesting** *Gossypium davidsonii* **in Sonora, Mexico.**—*Jl. Econ. Ent.*, xix, no. 3, p. 572. Geneva, N.Y., June 1926.

Larvae of the Thyridid, *Rhodoneura terminalis*, Wlk., were found infesting about 5 per cent. of the green bolls of a wild cotton, *Gossypium davidsoni*, on the west coast of northern Mexico. This moth has been found in Salvador, where the larvae were reported to be infesting the stems of cotton, Costa Rica and Santo Domingo. All the larvae found by the author were inside the bolls. The insect must be regarded as a potential pest of cultivated cotton.

VAYSSIÈRE (P.) & MIMEUR (J.). **Les Insectes nuisibles au cotonnier en Afrique occidentale française.**—8vo, ix+176 pp., 20 pls., 11 figs., 8 pp. refs. Paris, Lib. Emile Larose, 1926.

This monograph comprises a number of papers that have been previously noticed [*R.A.E.*, A, xiii, 110, 170, 390, 392, 460; xiv, 6, 9], and forms a complete guide to the insect pests that attack the important cotton crop of French West Africa, with recommendations for their control.

BALACHOWSKY (A.). **Note sur un Coccide de la faune néo-tropicale récemment acclimaté et nuisible au figuier en Algérie.**—*Bull. Soc. Hist. nat. Afr. N.*, xvii, no. 2, pp. 63–69, 1 pl., 4 figs., 6 refs. Algiers, 15th February 1926.

The Coccid, *Morganella longispina*, Morg., is recorded from the Botanical Garden at Algiers, where it has become established on *Ficus carica*, the cultivated fig of the district. As the form found in Algeria does not agree in all particulars with the original description, it is here re-described. The insect was first found in British Guiana, on *Cupania sapida*, and has been introduced into the Hawaiian Islands where it attacks *Citrus* and mango. The infested fig-trees have been cut down and burnt.

BALACHOWSKY (A.). **Note sur l'acclimatation des prédateurs du** *Parlatoria blanchardi* **Targ., dans la palmeraie de Colomb-Béchar, en vue de la lutte biologique contre ces Coccides.**—*Bull. Soc. Hist. nat. Afr. N.*, xvii, no. 2, pp. 93–96. Algiers, 15th February 1926.

The transference of two predators of *Parlatoria blanchardi*, Targ. [*R.A.E.*, A, xiii, 459] from one part of Algeria to another has now been accomplished. The Nitidulid, *Cybocephalus seminulum*, Baudi, appears to be definitely established and in six months has spread over a considerable distance from its point of liberation. With regard to *Pharoscymnus anchorago*, Fairm., only one individual, an adult, has been recovered in the winter. It is possible, however, that this Coccinellid, the life-history of which is unknown, hibernates in the adult stage. Biological control seems to be the only possible means of dealing with *P. blanchardi* on date-palms in Algeria, for neither burning (even with paraffin) nor insecticidal sprays will exterminate it; these measures give only temporary local relief, quickly followed by re-infestation from neighbouring palms.

DE BERGEVIN (E.). **Description d'une nouvelle espèce de** *Trioza* **(Hémiptère Psyllidae) produisant une galle sur** *Populus euphratica* **Oliv. var** *bonnetiana* **Dod., dans le Sud Orano-marocain.**—*Bull. Soc. Hist. Nat. Afr. N.*, xvii, no. 4, pp. 149–153, 1 pl., 5 refs. Algiers, 15th April 1926.

Trioza ceardi, sp. n., is described from the Moroccan side of South Oran, where it produces galls on *Populus euphratica* var. *bonnetiana*.

China (W. E.). **A New Genus and Species of Jassidae injurious to Maize in Kenya Colony, E. Africa.**—*Bull. Ent. Res.*, xvii, pt. 1, p. 43, 1 fig. London, July 1926.

Cicadulina zeae, gen. et sp. n., is described from Nairobi, on maize.

Uvarov (B. P.). **Notes on the Genus *Oxya*, Serv. (Orth., Acrid.).**—*Bull. Ent. Res.*, xvii, pt. 1, pp. 45–48. London, July 1926.

Grasshoppers of the genus *Oxya* are serious pests of rice and other irrigated crops in India and Malaya. *O. velox* has until recently been apparently the only species recorded in this respect, but as a matter of fact many species are involved, and the systematics of the genus have been hitherto very confused. A recent monograph [*R.A.E.*, A, xiv, 31], however, recognises 30 species, a number of which are definitely recorded as pests. In the present paper the synonymy of a number species is discussed, the author correcting certain minor mistakes occurring in the monograph, mostly of a nomenclatorial character.

Wolcott (G. N.). **Notes on the Insects of the Sea-grape, *Coccoloba uvifera*, (L.) Jacq., in Porto Rico and Adjacent Countries.**—*Bull. Ent. Res.*, xvii, pt. 1, pp. 49–52, 6 refs. London, July 1926.

Coccoloba uvifera (sea-grape) is very common in Porto Rico along the coast, chiefly on the sandy beaches, and harbours a number of insects, some of which occur only in Porto Rico or the adjacent islands, and many of which are restricted to this one food-plant. The most abundant are the Fulgorids, *Petrusina* (*Ormenis*) *marginata*, Brunn., *Petrusa* (*O.*) *pygmaea*, F., and *Ormenis quadripunctata*, F., which whiten the stems and lower surface of the leaves, and four others that are less common. An Aphid, probably *Toxoptera aurantii*, Boyer, is often present, and other insects include *Pseudococcus nipae*, Mask. ; the midge, *Ctenodactylomyia watsoni*, Felt. (with which *Cecidomyia coccolobae*, Cook, is probably synonymous) ; the moth, *Dichomeris zingarella*, Wlsm. ; the Chrysomelid, *Cryptocephalus perspicax*, Weise ; the sawfly, *Schizocera krugi*, Cress., very seldom found on any other food-plant and frequently stripping the entire foliage from the trees ; and a very abundant Membracid, *Enchenopa concolor*, Fairm.

Several weevils also attack this plant, including the new ones described in the next paper. Those occurring in Porto Rico include *Pachnaeus roseipes*, Chevr., which is more often a pest of *Citrus*, and *Euscelus* (*Attelabus*) *coccolobae*, Wolc. Though *Diaprepes abbreviatus*, L., has never been recorded on sea-grape in Porto Rico, this plant is extensively attacked in St. Kitts by *D. famelicus*, Ol.

Marshall (G. A. K.). **Two new species of Curculionidae (Col.) from Haiti.**—*Bull. Ent. Res.*, xvii, pt. 1, pp. 53–54. London, July 1926.

Descriptions are given of *Euscelus uviferae*, sp. n., and *Lachnopus bellus*, sp. n., on *Coccoloba uvifera* (sea-grape) in Haiti, these being two of the weevils referred to in the preceding paper.

GREEN (E. E.). **On some New Genera and Species of Coccidae.**—*Bull. Ent. Res.*, xvii, pt. 1, pp. 55–65, 9 figs. London, July 1926.

The following new genera and species are described: *Beesonia dipterocarpi*, the adult females of which occupy cavities in galls in the branches of *Dipterocarpus tuberculatus*, from Burma; *Pedroniopsis beesoni*, on the bark of *Shorea robusta*, from India; *Eutaxia moreirae*, on an undetermined shrub, from Brazil; *Neofurcaspis andamanensis*, on fronds of coconut (*Cocos nucifera*), from the Andaman Islands; *Neoleucaspis parallela*, on *Bambusa* sp., from India; and *Hybridaspis producta*, on leaves and twigs of *Loranthus signatus*, from Australia.

HOLDAWAY (F. G.). **The Pink Bollworm of Queensland.**—*Bull. Ent. Res.*, xvii, pt. 1, pp. 67–83, 1 map, 1 pl., 9 figs., 11 refs. London, July 1926.

In 1924, when a strong effort was being made in Queensland to re-establish the cotton industry on a commercial scale, it was reported that the pink bollworm, *Platyedra gossypiella*, Saund., had been discovered there. Recent investigation, however, shows that the insect occurring in Queensland is distinct from *P. gossypiella*; it is distinguishable from it on larval and pupal characters and is here described as *P. scutigera*, sp. n. The moths in captivity breed readily, and two females were observed to lay 117 and 135 eggs respectively. Almost all parts of the plant are liable to attack; early stage larvae are found outside the bolls, making holes in the rind or sheltering in the calyx, entrance being made to the bolls at any point under the calyx. After entering the boll the larvae work in the tissues of the carpels or in the central column, but eventually they attack the seeds. Larvae of different stages and pupae may occur together in a single boll. On the coast, where cotton grows in proximity to *Hibiscus* (one of the primary food-plants), the infestation may be as high as 70 to 90 per cent. Pupae occur both in cotton bolls and in the seed-capsules of *H. tiliaceus*, but whether these are the usual situations is not known. Very little is known about overwintering; in the coastal districts of Central Queensland, where frost is rare, the insect apparently passes the winter as a slow-feeding larva, while in other localities there are indications that it hibernates as a larva; it is possible that it may also do so in the adult stage. In Queensland, after a cold early winter the weather may become quite warm and moths may emerge as late as July. A species of *Microbracon*, not yet identified, has been bred from larvae of the bollworm. The first record of this species was in *H. tiliaceus*; this and *Thespesia populnea* are apparently the primary food-plants, cotton being a secondary one, while *H. divaricatus* and a yellow-flowered variety of *H. heterophyllus* are also attacked. The recorded distribution indicates that the insect has spread from these two primary food-plants, which only occur in the coastal region. Flight and distribution in cotton seed, aided by wind and the presence of *Hibiscus*, have been the main factors in dispersion; the larvae can live for some time in the seeds and have even survived ginning. The distribution in Queensland is discussed; it is significant that the cotton in South Queensland, where none is grown near the coast, remains uninfested. In view of the fact that the primary food-plants are indigenous, the destruction of all infested cotton is useless.

The characters differentiating *P. scutigera* and *P. gossypiella* are discussed. There are also two other species of *Platyedra* occurring on native Malvaceae in Queensland, but although they are both present in cotton-growing localities, they have never been found to attack the crop. The present knowledge of the food-plants of these four species in Australia is detailed.

The true *P. gossypiella* apparently only occurs in Western Australia and the Northern Territory.

MacDougall (R. S.). *Pseudococcus comstocki*, **Kuw., as an Enemy of the Banana** (*Musa cavendishii*).—*Bull. Ent. Res.*, xvii, pt. 1, pp. 85–90, 7 pls., 5 refs. London, July 1926.

Banana plantations in the Canary Islands are infested with *Tetranychus* sp. and a species of thrips, both of which are minor pests, and with two much more important ones, the Lepidopterous miner, *Hieroxestis subcervinella*, Wlk., and the scale, *Pseudococcus comstocki*, Kuw. This mealybug is found on *Musa cavendishi*, the fruit of which is the chief export of the Canary Islands, in varying degrees of intensity in Teneriffe, Grand Canary and Gomera. A description of the insect is given and its distribution discussed. In the Canary Islands, with a favourable climate throughout the year, the generations largely overlap. The mealybug was found on all above-ground parts of the banana plant, but not on the roots or on the true stem, which is underground. The insects invade the axis bearing the bunches of fruit and thence pass to the fruits. In the plantations, children destroy numbers of the mealybugs by wiping them off with cloths, especially from the groove on each side of the main rib of the blade on both upper and lower surfaces. This is more effectual than any spray. When a new plantation is being established with tubers or suckers from another area, these might be disinfected by dipping in paraffin emulsion previous to planting. Experimental work is being done to test the possibilities of control by fumigation. No insect enemies seem to be present, probably owing to the protection afforded to the mealybugs by *Iridomyrmex humilis*, Mayr (Argentine ant).

Other Coccids occurring on banana in these islands are *Aspidiotus cyanophylli*, Sign., *A. hederae*, Vall., *A. lataniae*, Sign., *Ceroplastes actiniformis*, Green, *Saissetia* (*Lecanium*) *nigra*, Nietn., and *Diaspis boisduvali*, Sign.

Ramakrishna Aiyar (T. V.). **The Braconid Genus** *Aphrastobracon*, **Ashm.**—*Bull. Ent. Res.*, xvii, pt. 1, pp. 91–98, 1 fig. London, July 1926.

The genus *Aphrastobracon* was erected by Ashmead in 1895, for the Braconid, *A. flavipennis*, bred from the lac insect, *Laccifer* (*Tachardia*) *albizziae*. Since that time, there has been no further record of this insect. The author has observed it, however, in several parts of South India, and in the present paper discusses the systematic position and affinities of the genus and describes the structural features of *A. flavipennis*. It was found that the real host of this species was not a Coccid, but the Noctuid larva, *Eublemma scitula*. The latter is a predacious enemy of the scales, *L.* (*T.*) *lacca*, *Pulvinaria maxima* (nim mealy scale), *P. psidii* (guava mealy scale) and *Anomalococcus indicus* (babul scale). *E. scitula* protects itself with the empty shells and exuviae of the Coccids it has devoured, and later uses these for its cocoon, except when attacking the lac insect, in which case it burrows into the mass of the lac insects and remains in tubular galleries. It is when the insect is moving about with comparatively little protection that the Braconid parasitises it. Only one grub has as yet been found on a single caterpillar. Pupation occurs inside a silken cocoon within the original covering of *E. scitula* and occupies about 8 to 10 days. Apparently there is no record of this Braconid anywhere in North India, and if it is proved not to occur there, it will certainly be worth while to introduce it both there and into Central India, where the lac industry is seriously hampered by the activities of *Eublemma* spp., though it must be remembered that it also attacks larvae that destroy injurious Coccids. The only other known species of *Aphrastobracon* are *A. philippinensis* from the Philippines, and *A. gratiosus* and *A. guttifer*, from West Africa. A fifth species has been found in South India, and is here described as *A. maculipennis*, sp. n. A key to the species of this genus is given.

MUMFORD (E. P.). **Cotton Stainers and certain other Sap-feeding Insect Pests of the Cotton Plant. A Preliminary Enquiry into the Effect of Climatic and Soil Conditions upon the Incidence of these Pests.**—8vo, 79 pp., 14 pp. refs. London, [Empire Cotton Growing Corporation] 1926.

Although this paper deals mainly with *Dysdercus* spp. (cotton-stainers) as pests of cotton and the relation of various factors in the growth and cultivation of cotton to injury by them, its basic principles are of far wider application, and observations in support of them are drawn from numerous sources. Over seventy species of *Dysdercus* are known, and twenty-one of these have been recorded as feeding on cotton ; the remainder must be regarded as potential cotton pests. The only cotton-growing areas of importance where injurious species of *Dysdercus* do not occur are Egypt, Mesopotamia, and South Russia. Cotton-stainers, on account of the direct injury that they cause and of the rots that they introduce into the bolls, are of very great importance as cotton pests, particularly in the West Indies and Southern Nigeria, and are likely to prove so in the future where cotton is planted in new areas.

From the consideration of data on the prevalence of *Dysdercus* in connection with climatic conditions, especially rainfall, it appears that damp conditions generally favour infestation, and that it is only serious in regions of excessive moisture, but that the ability of *Dysdercus* to transmit internal boll rot is not affected by climate. A close study of records of injury by *Dysdercus* in the West Indies during a period of eleven years does not, however, support this theory, but gives evidence that serious injury usually follows a prolonged drought early in the year, and perhaps also coincides with excessive rain later in the year.

The possibility that the influence of climate on the prevalence of *Dysdercus* might only be indirect, through its influence on the plant, was then considered. Available evidence points to the fact that either shortage or excess of water at the roots of the cotton plant results in shortage of water in the plant tissues, causing a decline in the health of the plant and in its resistance to insect attack. In discussing the resistance of plants to insects the author points out that it is of two kinds, external, due to some character such as thickened cuticle, and internal, due to some condition of the sap. He suggests that the reason why the disturbance of the water balance in the cotton plant increases its susceptibility to insect attack may be that it renders the sap more attractive to insects by altering the concentration or constitution of the carbohydrates in it. The causes of shortage of water in the tissues of the cotton plant, excessive transpiration and defective root absorption, and the factors affecting them are discussed; poor soil aeration is an important cause of reduced root absorption, and this explains why excess of water as well as drought causes water shortage in the tissues. The chemical composition of the soil, on which depends an adequate supply of plant food, is also undoubtedly of importance in affecting the susceptibility of the plant to insect attack.

All the factors affecting the health of a plant are, however, interdependent, and must be studied in attempting to increase its resistance to insects, and it must be borne in mind, in this connection, that health is not synonymous with luxuriant growth.

In an appendix is given a list of the known species of *Dysdercus*, with their distribution, also lists of the species occurring in the various regions of the world. The bibliography is divided into three sections; the first contains references to papers on *Dysdercus* as pests of cotton and on other matters in connection with the pests and cultivation of cotton discussed; the second contains references to papers on the resistance of plants other than cotton to insects; and the third, references to the distribution of *Dysdercus*.

PRELL (H.). **The Amoeba-Disease of Adult Bees: a little-noticed Springtime Disease.**—*Bee World*, viii, no. 1, pp. 10–13, 5 figs. London, June–July 1926.

This is a translation from the German of a paper already noticed [*R.A.E.*, A, xiv, 416].

PARKER (T.). **General Principles relating to the Control of Insect Pests and Fungoid Diseases.**—*Hortic. Trade Jl.*, reprint, 35 pp. Burnley [1926]. Price 1*s*.

Among the general methods of insect control dealt with in this course of lectures the author discusses dormant and summer sprays, dusting, fumigation and the control of glasshouse pests, and partial sterilisation of the soil by means of heat and chemicals.

The Grub Pest and Paris Green as a Remedy.—*West of Scotland Agric. Coll.*, Bull. 103, pp. 149–157, 1 ref. Glasgow, 1925. [Recd. July 1926.]

Serious damage to various crops in the south-west of Scotland was caused in 1923 and 1924, in spring, by larvae of *Tipula oleracea*, L., and *T. paludosa*, Mg., oats and turnips being the most severely attacked. The life-history of *T. oleracea* is described; it is similar to that of *T. paludosa* [*R.A.E.*, A, v, 361]. The larvae appear to feed during the day as well as at night, although it is then that they are most active and feed above ground. The young larvae are quickly killed by drought and bright sunlight, but are favoured by wet weather, a fact that may account for their recent abundance; even flooding, if not unduly prolonged, does not appear to be fatal to them; older larvae can survive exposure to frost of considerable severity, but normally burrow into the ground to a depth of 6 inches or less, and probably remain quiescent during severe cold.

The control measures recommended include the encouragement of birds, several species being valuable natural enemies of the larvae; making grass-land that is to be ploughed up unattractive to the ovipositing flies by grazing it closely and liming or by letting it stand for hay, during the previous year; manuring to increase the vigour of the crop; change of seed, and in the case of oats, sowing varieties that tiller freely, as they are better able to recover from larval attack; and the use of a Paris green and bran bait [*R.A.E.*, A, xiii, 533], the making of which is described. The cost of this bait is about 6*s*. 6*d*. per acre, and excellent results have been obtained with it; so far as has been observed, its employment has not resulted in harm to wild birds.

STANILAND (L. N.). **Some Observations on Strawberry Eelworm.**—*Ann. Rept. Agric. & Hortic. Res. Sta., Long Ashton, Bristol, 1925*, pp. 61–65, 1 fig. Bristol, 1926.

In connection with experiments with *Aphelenchus* [*fragariae*, R.-B.] in relation to "red plant" and "cauliflower" diseases of strawberries [*R.A.E.*, A, xiii, 486], an apparatus was devised by means of which it is possible to obtain large numbers of Nematodes from plant tissues in a small volume of water. A large glass boiling tube, about 1½ ins. in diameter, is fitted with a three-hole rubber cork; through the central hole passes the stem of a long, parallel-sided funnel, which reaches almost to the bottom of the tube; through the other holes pass short lengths of glass tubing, one with a hand bellows attached, and the other narrowed down to a fine aperture externally; a perforated zinc disc the diameter of which is slightly less than that of the funnel, with a length of wire soldered on to it for handling, is placed in the funnel, and the material from which the Nematodes are to be obtained is placed on it. A little water is poured through the funnel, into which it is forced again by working the bellows; the amount of water should be sufficient to cover the material in the funnel when forced up it, so that further blowing sends bubbles of air through it and most of the Nematodes are dislodged. When blowing ceases, the liquid falls back into the tube; the aperture of the tube that gives access to the outer air should be so adjusted that it does so fairly quickly. The process is repeated several times with fresh material, but with the same water.

By stirring the water and counting the number of Nematodes in one or two drops, it is possible to estimate the approximate number in a given volume; no method has been found for separating *Aphelenchus* from other Nematodes, but the percentage can be calculated. If the concentration of Nematodes in the water is low, a centrifuge may be employed.

A number of apparently healthy strawberry plants examined were found to contain *Aphelenchus* and other Nematodes of the genera *Rhabditis*, *Cephalobus* and *Dorylaimus*. In September and November 1924 the leaf bases of 24 strawberry plants and the growing points of 8 plants were infected with 10 *Aphelenchus* each; by January 1926 neither these plants nor control plants of the same batch had developed "red plant" or "cauliflower" disease. Attempts to breed *Aphelenchus* in strawberry leaf-extract agar and in other ways failed, although these methods were successful with *Rhabditis* and *Cephalobus*. This result suggests that *Aphelenchus* is not free-living.

Samples of soil taken from the neighbourhood of strawberry plants affected by "red plant" disease were shaken up with solutions of common salt and of calcium chloride, the former giving better results, and then left to settle. Although considerable numbers of Nematodes were found in this way to be present in the soil, only about 5 per cent. were *Aphelenchus*; it is thought that these had probably been washed into the soil from the leaves and only occurred there accidentally.

Lees (A. H.) & Staniland (L. N.). **Tar Distillate Wash Trials in the Bristol Province.**—*Ann. Rept. Agric. & Hortic. Res. Sta., Long Ashton, Bristol, 1925*, pp. 77–82. Bristol, 1926.

The results of spraying trials with five proprietary tar distillate washes on apples and plums in various localities are given. In considering the value of a winter wash, it is advisable to take into account its effect not merely on one pest, however important that one may be, but also on other pests of less importance. Two of the washes tested effectively controlled Aphids and *Psylla mali* both at 4 per cent. and 8 per cent. strengths and considerably reduced infestations by Lepidopterous larvae and Capsids at 8 per cent. Two of the remaining three washes gave moderately good results in most cases. It is considered that trials extending over a number of years are necessary to decide on the relative merits of washes of this type. In view of possible injury to the trees, tar distillate washes should not be applied to plums later than the middle of January or to apples later than the middle o February.

Report on Advisory Work, 1924-25. Economic Entomology.—*Ann Rept. Agric. & Hortic. Res. Sta., Long Ashton, Bristol, 1925*, pp 137–142. Bristol, 1926.

In Gloucestershire, Worcestershire and Herefordshire serious damage to apples was caused by the Capsid, *Plesiocoris rugicollis*, Fall.; whole crops of fruit were rendered almost unsaleable, and in July the winged adults damaged the new shoots; the winged adults also migrated to black currants and fed on the leaves, causing "temporary reversion" In some cases the eggs appear to have been laid in the shoots of black currant, as injury was noticed in April and May. The most successfu method of controlling *P. rugicollis* on apple was the application of tar-distillate washes in the winter against the eggs, followed by spraying with miscible oil in the spring. In the Cheltenham district *Lygus pabulinus*, L., apparently migrated from potatoes to gooseberries and then to black currants, where it was found in company with *P. rugicollis*. These two Capsids almost destroyed a crop of strawberries on which they occurred together in July. Among other insects reported during the year *Cavariella capreae*, F. (willow aphis) did considerable damage in Somerset, and *Contarinia pyrivora*, Riley (pear midge appears to be on the increase in Gloucestershire. Tests with calcium cyanide for fumigating greenhouses indicated that ⅔ oz. per 1,000 cu ft. are needed to obtain satisfactory results; the plants treated were fuchsias and tomatos, and no injury to them was observed. The same number of fumigations was needed with calcium cyanide as with sodium or potassium cyanide and sulphuric acid.

THEOBALD (F. V.). **Three New British Aphides.**—*Ent. Mo. Mag.*, lxii, no. 746, pp. 162–165, 3 figs. London, July 1926.

The new Aphids described are *Aphis triglochinis* on *Triglochin maritimum* and *Anuraphis prunifex* on *Prunus spinosa* from Kent, and *A. sherardiae* on *Sherardia arvensis* from North Wales.

MANON (—). **Notes sur *Liparis dispar*, L., et quelques-unes de ses variétés.**—*Rev. Zool. agric. & appl.*, xxv, nos. 3 & 4, pp. 39–42 & 49–55, 1 fig. Bordeaux, March & April 1926.

A general account is given of the bionomics of *Porthetria* (*Liparis*) *dispar*, L. The Carabid, *Calosoma sycophanta*, L., which is one of its chief natural enemies, is unfortunately very rare in French orchards. The egg-clusters should be brushed with milk of lime. Numerous aberrations of this moth are described.

FEYTAUD (J.). **La Question du Doryphora.**—*Terre vaudoise*, xviii, no. 32, pp. 482–485. Lausanne, 7th August 1926.

The history of *Leptinotarsa decemlineata*, Say (Colorado potato beetle) in France since its discovery in Gironde in 1922 is outlined, and its present distribution and the remedies practised against it are described. There is urgent need for propaganda on the subject throughout France, so that watch may be kept for its appearance in any fresh centre. Potato fields require observation every fortnight as a precaution throughout the entire growing season. The organisation of a defence service to guard against similar invasions in the future, the immediate extinction of known centres of infestation, and the necessity for uniformity and co-ordination of effort throughout the regions interested are urged.

CHAPPAZ (G.). **La Cochylis et l'Eudémis.**—*Vie agric. & rurale*, xxix, no. 29, pp. 34–39, 8 figs. Paris, 17th July 1926.

This is a general account of the vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] and of the usual remedies practised against them.

GABRIEL (C.). **Observations sur quelques galles de Curcubitacées à *Heterodera radicicola*, Greef.**—*C.R. Soc. Biol.*, xcv, no. 25, pp. 494–497, 3 figs., 4 refs. Paris, 16th July 1926.

Galls produced by *Heterodera radicicola* on cucurbitaceous plants are described.

GABRIEL (C.). **Parthénogénèse chez les Anguillules radicicoles.**—*C.R. Soc. Biol.*, xcv, no. 25, pp. 497–498, 2 refs. Paris, 16th July 1926.

The author's observations show that reproduction of *Heterodera radicicola* takes place in the tubers of *Bryonia*, several succeeding generations infesting the same one, and from the circumstances it seems evident that reproduction is parthenogenetic.

STEINER (G.). **Parasitic Nemas on Peanuts in South Africa.**—*Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxvii, no. 16–24, pp. 351–365, 4 pls., 9 refs. Jena, 6th July 1926.

The material on which this study is based came from diseased peanut plants [*Arachis hypogaea*] from the Transvaal, and consisted of stems, leaves and so-called "rosettes," these being a shortened condition of the stems resulting in a "rosette" appearance. A total of 688 Nematodes was secured, belonging to ten species, some of which are new. Their economic status is uncertain, and though some of them have been thought to be associated with rosette disease, it is now generally believed that this is a disease of the virus group, transmitted by Aphids [*cf.* *R.A.E.*, A, xiii, 524].

RIEHM (E.). **Anwendung staubformiger Mittel im Pflanzenschutz.** [The Use of Dust Insecticides and Fungicides.]—*Zeitschr. angew. Chemie*, xxxviii, 1925, p. 1032. (Abstract in *Centrabl. Bakt. Paras. Infekt.*, IIte Abt., lxvii, no. 16–24, p. 418. Jena, 6th July 1926.)

In Germany insecticides and fungicides are usually used in liquid form, with the exception of sulphur and calcium arsenate used in vineyards, but dusts present many advantages and a number, containing mercury or arsenic as the effective ingredient, are being studied. The tobacco dusts commonly used in America have not been tried in Germany, and would probably prove too expensive. Carbon bisulphide is the soil disinfectant in common use in Germany, and it is not likely to be replaced by a dust.

HILGENDORFF (G.) & TRAPPMANN (W.). **Weitere Bodendesinfektionsversuche.** [Further Experiments in Soil Disinfection.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 8, pp. 59–61. Berlin, August 1926.

In further experiments to discover other substances suitable for soil disinfectants against the Colorado potato beetle [*Leptinotarsa decemlineata*] [*R.A.E.*, A, xii, 438 ; xiii, 299] success was attained with products of coal-tar oil of low boiling point such as raw benzol and first light oil of benzol, and with a wood-tar oil distillate. A proprietary preparation proved excellent on account of its high content of carbon bisulphide, but its practical value depends on its being able to compete in cost with pure carbon bisulphide and particularly with the tar oils.

DYCKERHOFF (—). **Der gefurchte Dickmaulrüssler** (*Otiorrhynchus sulcatus* **Fabr.) an Cyclamen.** [*O. sulcatus* on Cyclamens.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 8, pp. 61–62, 3 figs. Berlin, August 1926.

Injury to cyclamens by larvae of *Otiorrhynchus sulcatus*, F., introduced in peat, has been noticed in a greenhouse. This can only be prevented by storing the soil for a year or sifting it. Disinfection of the soil by means of chemicals or heat is not recommended.

Heuschreckenöl für Flugzeuge. [Locust Oil for Aircraft.]—*Illustrierte Technik für Jedermann,* no. 11, 9th September 1925. (Notice in *Anz. Schädlingsk.,* ii, no. 7, p. 90. Berlin, 15th July 1926.)

Locusts in Algeria yield an oil highly suitable for the motors of aircraft as it withstands a great degree of cold without freezing. In 1925, up to the time of writing, some 18 tons of locusts were shipped from Algeria to Holland, partly for poultry food and partly for the extraction of this oil.

HERING (M.). **Die Oekologie der blattminierenden Insektenlarven.** [The Ecology of Leaf-mining Insect Larvae.]—8vo., 254 pp., 67 figs., 2 pls., 19 pp. refs. Berlin, Gebrüder Borntraeger, 1926. Price *G.M.* 18.

This book deals very fully with the ecology of leaf-mining larvae. It is will be followed by a monograph by the author on the leaf-mines of the Palaearctic region.

TOMSA (K.). **A New Pest of Grain.** [*In Czech.*]—*Ochrana Rostlin,* vi, no. 3. pp. 36–37. Prague, May 1926.

The Anthomyiid, *Anthomyia* (*Paregle*) *radicum,* L., is recorded from two different localities in Czechoslovakia as attacking wheat. Its importance as a pest of grain requires further investigation.

STRAŇÁK (F.). **Pests and Diseases of Flax.** [*In Czech.*]—*Ochrana Rostlin,* vi, no. 3, pp. 37–40, 3 figs. Prague, May 1926.

A brief account is given of the cultivation of flax and the various diseases and pests likely to attack it. They include *Tylenchus dipsaci* (*devastatrix*), *Tetranychus telarius* (*althaeae*), *Thrips linarius, Aphthona euphorbiae, Longitarsus parvulus, Cnephasia wahlbomiana, Phalonia epilinana, Phytometra* (*Plusia*) *gamma,* and *Polia* (*Mamestra*) *pisi.*

[BUGDANOV (G. B.).] **Бугданов (Г. Б.). Review of Agricultural Pests of the eastern Caucasus (Ossetia, Ingushetia, Sunzha Region) for 1922-1925.** [*In Russian.*]—Vladikavkazsk. Stantz. Zashchit. Rast. pri Gorsk. S.-Kh. Inst. [*Vladikavkaz Sta. Plant Prot. Gorsk. Agric. Inst.*], 15 pp. Vladikavkaz, 1926. (With Summaries in English and German.)

Brief notes are given on the seasonal and local occurrence of insect pests of field and fruit crops as observed in 1922–25.

[SUKHORUKOV (N. N.).] **Сухоруков (Н. Н.). Observations on *Phylloxera* in the Kuban Region in 1925.** [*In Russian.*]—Kubansk. Stantz. Zashchit. Rast. [*Kuban Plant Protect. Sta.*], Ser. A, no. 1, 32 pp., 1 map, 1 fig. Krasnodar, 1926.

As a result of a survey of *Phylloxera* in the northern Caucasus, the history of which is reviewed, areas of infestation appear to have remained very much the same from 1913 to 1925, indicating the great powers of resistance of the vines, as in spite of infestation throughout that period they are still bearing fruit.

Ballou (C. H.). **Los Coccidos de Cuba y sus Plantas Hospederas.** [The Coccids of Cuba and their Food-plants.]—*Estación exptl. agron.*, Bol. 51, 47 pp. Santiago de las Vegas, April 1926.

This list of the Coccids of Cuba comprises 104 species, of which 79 have been definitely identified.

Ogilvie (L.). **Seasonable Notes on Plant Diseases and Pests.**—*Agric. Bull. Bermuda Dept. Agric.*, v, no. 5, pp. 3–4. Bermuda, May 1926.

Peregrinus maidis on maize can be controlled by several applications of nicotine dust during the heat of the day ; dusting with lead arsenate may be employed for the control of *Heliothis* (*Chloridea*) *obsoleta* (corn ear-worm) ; late planting of maize should be avoided as both these pests are most plentiful late in the season. For the control *Diaphania* (*Margaronia*) *hyalinata* (melon borer) and *D.* (*M.*) *nitidalis* (pickle worm) on melons the leaves should be dusted with lead arsenate or sprayed with ¾ oz. lead arsenate dust in 1 gal. water, at intervals of about 10 days. If *Aphis gossypii* is not kept sufficiently in check by parasites, the melons should be dusted with nicotine dust or sprayed with 1 part 40 per cent. nicotine sulphate and a little soap in 800 parts water, during the heat of the day ; nicotine dust may also be used to control *Trialeurodes* (*Dialeurodes*) *vaporariorum* (white-fly) on these plants. If citrus whitefly [*Dialeurodes citri*] is abundant, the trees should be sprayed with an oil emulsion about two weeks after the disappearance of the adults, to destroy the larvae.

Herrick (G. W.). **The " Ponderable " Substance of Aphids (Homop.).**—*Ent. News.*, xxxvii, no. 7, pp. 207–210. Philadelphia, Pa., July 1926.

Basing his calculations on breeding experiments with *Brevicoryne brassicae*, L. (cabbage aphis), the author estimates the total weight of the descendants of a single stem-mother that would be produced from the end of March to the middle of August, if every Aphid survived and reproduced at the same rate. In New York *B. brassicae* produced 12 generations between 31st March and 15th August, and 16 generations between 31st March and 2nd October, and each female produced, on the average, 41 young.

Back (E. A.) & Cotton (R. T.). **The Granary Weevil.**—*U.S. Dept. Agric.*, Dept. Bull. 1393, 35 pp., 9 figs., 73 refs. Washington, D.C., May 1926. [Recd. July 1926.]

Calandra (*Sitophilus*) *granaria*, L. (granary weevil) appears to be confined, as an established pest, to temperate climates ; it is common throughout the northern United States, but does not often breed further south than North Carolina, and taking the country as a whole, is a far less serious pest of stored grain than *C.* (*S.*) *oryzae*, L. (rice weevil). The literature on the life-history and control of *C. granaria* is briefly reviewed, and the nature of the damage that it causes described. All stages of the weevil are described and illustrated.

C. granaria normally hibernates either as an adult or as a larva, and the adults are able to survive very cold winters ; in the early spring the adults resume activity and the larvae pupate. Sometimes the adults feed for a considerable time inside the grains occupied by the larvae; pairing takes place soon after emergence and is repeated at frequent intervals during the life of the weevils. Eggs may occasionally be produced parthenogenetically, but these do not hatch. Much of the data given by the authors on the life-history of *C. granaria* in relation to temperature closely parallels that obtained in Russia by Strakhov-Kolchin [*R.A.E.*, A, iii, 487]. Adults survived without food longer at moderate than at high temperatures; at 55° F. 50 per cent. lived for three weeks and a single individual for 65 days, while at 85° F. they were very active and 50 per cent. died within a week and only one lived for 19 days; humidity was rather high. The average length of life of females with food was 7–8 months, although several individuals lived for more than a year; at a temperature ranging from 50 to 60° F. several adults remained alive for more than three years. The pre-oviposition period is about three weeks in the early spring and six days in the summer, but females emerging in the autumn do not usually lay eggs until the following spring. The average length of the oviposition period of females emerging in spring or summer was 3–4 months, during which time 1–3 (rarely 4 or 5) eggs were laid by each daily, the total number of eggs laid by one female ranging from 36 to 242. Females that emerged in the autumn and began to oviposit before hibernation continued in the spring and had longer oviposition periods, one laying 254 eggs in 287 days.

Each egg is laid in a hole eaten out of a grain by the female, and is covered with a secretion from the ovipositor that hardens into a protective covering; the eggs hatched in 4 days at a temperature of 78–80° F., in 15 days at 61° F., and not at all above 95°F. or below 50–55° F. The larvae are able to feed in the grain of maize, oats, barley, rye, wheat and other cereals, also in macaroni and other preparations of flour, but not in finely divided substances. They develop in grain with a moisture content of 8 per cent. but a moisture content of 14–15 per cent. is more favourable to them. The larva moults three times, and the first three instars last 4 to 5 days and the fourth 6 to 19 days, during the summer. At temperatures of 70–93° F. in the summer the larval period lasted from 19 to 34 days; at 49–77° F. in the winter the longest larval period was 59 days. The larva pupates in a cell at the end of its burrow after 1–2 days as a prepupa, and the pupal stage lasts from 5 to 16 days according to temperature. The complete life-cycle from egg to adult occupies from 30 to 40 days in the summer, and at Washington there are three or four generations a year.

C. granaria is not resistant to high temperatures [*R.A.E.*, A, xiii, 46], but is very resistant to cold; adults survived for 73 days at a temperature of 30–35° F., 46 days at 25–30° F., 33 days at 20–25° F., 14 days at 15–20° F., 7½ hours at 5° F. and 5 hours at 0° F. At 30° F. 20 per cent. of the eggs survived for 28 days and larvae survived for 44 days. The chief parasites of the larvae and pupae in North America are *Aplastomorpha calandrae*, How., and *Chaetospila elegans*, Westw., which may be abundant but cannot be depended upon for control. A mite, *Pediculoides ventricosus*, Newp., is predacious on all stages of the weevil. Heat and fumigation are the chief means of control; all stages are killed by subjection to a temperature of 118–120° F. for 1 hour or 130° F. for 30 minutes, but it is necessary that these temperatures should be reached throughout the infested grain. All stages are killed by fumigating with carbon bisulphide, using from 5 to 15 lb. per 1,000 bushels of grain ; a mixture of ethyl acetate and carbon tetrachloride and the latter alone are less effective fumigants and somewhat unreliable [see next paper], the amount of fumigant required being two to four times as much as with carbon bisulphide.

BACK (E. A.) & COTTON (R. T.). **Control of Insect Pests in Stored Grain.**—*U.S. Dept. Agric.*, Farmers' Bull. 1483, 30 pp., 33 figs. Washington, D.C., June 1926.

In the United States wheat and maize, except in the north, are usually slightly infested by the Angoumois grain moth [*Sitotroga cerealella*, Oliv.] and the rice weevil (*Calandra* (*Sitophilus*) *oryzae*, L.) before they are harvested, the infestation being derived from stored grain of the previous year. Considerable saving can be effected by fumigating the grain as soon as possible after the harvest, while the insects are still present in small numbers, this being the only method that is generally practicable for farmers. The types of buildings best suited for storing grain on farms with a view to fumigation and the methods of fumigating are described. Fumigants that are lighter than air, such as hydrocyanic acid gas, are not considered suitable for the treatment of grain in bulk ; sulphur dioxide, which was formerly much used for the fumigation of grain in ships, is also unsuitable, as it destroys the germinating power of seeds and affects the baking quality of flour made from wheat fumigated with it. The relative value of three fumigants the vapours of which, being heavier than air, penetrate through all the grain in a bin and, under favourable conditions, destroy all stages of the insects infesting it are discussed ; carbon bisulphide, apart from its explosive and inflammable nature, is the most satisfactory, being the cheapest and most effective ; where it is unsafe to use it, a mixture of carbon tetrachloride and ethyl acetate [*R.A.E.*, A, xiii, 51, 335] or carbon tetrachloride alone should be used ; the former is the more efficient fumigant but imparts an odour to the grain that may be retained by flour made from it ; the odour cannot be detected in bread made from this flour, provided that the highest grade of chemicals is used in fumigating. Good grades of carbon bisulphide and carbon tetrachloride do not leave an odour on grain fumigated with them. Fumigation of grain will not be effective at temperatures lower than 60–65° F., but it may be necessary during cold weather if the feeding of insects causes heating of the grain. Covering grain that is being fumigated with sacking or tarpaulin assists in maintaining a high concentration of vapour. In a thoroughly air-tight chamber, 4 lb. carbon bisulphide per 1,000 cu. ft. will kill all insects, but normally about 8 lb. should be used while in a chamber not particularly well built 20 lb. may be necessary [*cf.* preceding paper].

LARRIMER (W. H.). **The Clover Leaf Weevil and its Control.**—*U.S. Dept. Agric.*, Farmers' Bull. 1484, 5 pp., 7 figs. Washington, D.C., May 1926. [Recd. July 1926.]

This is a brief popular account of the life-history of *Hypera punctata*, F. (clover leaf weevil) in the United States [*R.A.E.*, A, ix, 312]. In addition to the various species of clover [*Trifolium*], it attacks lucerne, sweet clover [*Melilotus*] and some varieties of beans, and has also been found on non-leguminous plants. Although there is normally only one generation a year in the United States, there may be a partial second in exceptional seasons ; in this case the larvae that hatch earliest in the autumn complete their development before winter, producing adults that hibernate and oviposit in the spring. If artificial control measures are considered necessary, spraying with 2 lb. powdered lead arsenate and 1 lb. soap in 50 U.S. gals. water at the rate of 100 U.S. gals. per acre will give good results.

SPENCER (H.) & STRONG (W. O.). **The Potato Tuber Worm. History in Virginia.**— *Virginia Truck Expt. Sta.*, Bull. 53, pp. 419–463, 4 figs., 3 refs. Norfolk, Va., 1st October 1925. [Recd. July 1926.]

Phthorimaea operculella, Zell. (potato tuber worm) has recently appeared in destructive numbers in eastern Virginia. Observations are being made on the bionomics under local and storage conditions, on which the present paper is a preliminary report. Experiments in interbreeding, etc., are described that prove the identity of the tobacco split worms and potato tuber worms. The technique employed in the rearing of the insects both under natural and controlled conditions is described. Under outdoor conditions with a mean temperature of 57° F. eggs laid about the middle of April hatched in 10–15 days; in October under slightly cooler conditions they hatched in 14–16 days. From June to August with mean temperatures from 74° to 83° F. they hatched in from 3 to 9 days. Under outdoor insectary conditions there was a great variation in the duration of the larval stage, from a few days in August to several months in the late autumn and winter. The minimum length of the pupal stage in the hot weather is 3 days, whilst under hibernating conditions it lasted as long as 112 days in one instance. The total life-cycle varies from a minimum of 12 days in mid-summer to several months in the winter. There are apparently from six to eight generations a year, but after the third they overlap to such an extent that they cannot be readily distinguished ; breeding is continuous, and all stages are present in numbers until long after the frosts have started.

Both larvae and pupae survive winter conditions, particularly where piles of infested potatoes are dumped in the woods ; a large number are also carried through the winter in barrels of stored home-grown autumn seed potatoes.

P. operculella apparently only attacks solanaceous plants, and besides potato and tobacco, it is recorded from jimson weed (*Datura stramonium*), egg-plants, tomatos, horsenettle (*Solanum carolinense*) and chillies.

Fumigation experiments with carbon bisulphide or hydrocyanic acid gas were not so satisfactory as was expected, though pending the completion of further experimental work it is recommended that where the temperature in storage is 45° F. or above 2 or 3 fumigations should be made at a 2 weeks' interval, using carbon bisulphide at the rate of 12 lb. per 1,000 cu. ft. or hydrocyanic acid gas at the rate of 12 oz. sodium cyanide per 1,000 cu. ft. The use of 15 lb. and over of carbon bisulphide caused injury to the potatoes. Arsenical dusts and sprays and nicotine preparations gave negative results in the field.

Various cultural practices, such as keeping the tubers well covered with soil, early planting, etc., are discussed as assisting in the control of this pest.

Certain unidentified Hymenopterous parasites have been found, and surveys are now being made to determine their distribution and importance in the control of *P. operculella* in Virginia.

Chittenden (F. H.). U.S. Bur. Ent. **A Foreign Cabbage Flea-beetle in the United States.**—*Proc. Ent. Soc. Wash.*, xxviii, no. 6, pp. 139–141. Washington, D.C., June 1926.

The Halticid *Phyllotreta aerea*, Allard, is very injurious to seedling radishes in New York State, attacking first the cotyledons and then the smaller leaves as they develop. Both radishes and other cruciferous crops may be entirely destroyed. A description of this beetle is given with notes on related European species.

Caudell (A. N.). U.S. Bur. Ent. ***Diestrammena*** **occurring in Wells (Orthoptera: Tettigoniidae).**—*Proc. Ent. Soc. Wash.*, xxviii, no. 6, p. 150. Washington, D.C., June 1926.

A case is recorded of heavy infestation of a well, in winter, with *Diestrammena japonica*, Blatch., in spite of the well having been twice drained off and the brick walls washed. This insect is usually found only in greenhouses.

Severin (H. C.). **The Common Black Field Cricket,** ***Gryllus assimilis*****, Fab., and its Control.**—*16th Ann. Rept. State Ent. S. Dakota, 1924–25*, pp. 10–16. Brookings, S. D., 1925. [Recd. July 1926.]

Gryllus assimilis, F. (black field-cricket) is a pest of major importance in South Dakota. Many plants are attacked, but lucerne is the favourite food-plant, and whole fields of this crop may be destroyed in a few days. Its natural enemies and many of the remedies for it have previously been discussed [*R.A.E.*, A, xiii, 89]. Destruction of the eggs is the best measure, and this can be accomplished by exposure for 5 hours to sun and wind, by means of a spring-tooth harrow run lengthwise over the field and then crosswise a few days later, the edges of the fields and the tops of irrigation ditches being also gone over. An attempt was made to control the crickets in lucerne fields by the use of calcium cyanide granules, but not more than 10 per cent. of the crickets were destroyed in any of the experiments. Old stacks of hay or piles of weeds may give shelter to thousands of crickets and should be burned during the middle of the day.

Gilbertson (G. I.). **The Wheat-stem Maggot.**—*South Dakota Agric. Expt. Sta.*, Bull. 217, 28 pp., 8 figs., 9 refs. Brookings, S.D., November 1925. [Recd. July 1926.]

The Chloropid, *Meromyza americana*, Fitch, is a serious pest of wheat in South Dakota. Other food-plants are barley, rye, emmer, timothy, oats and numerous grasses. Its various stages are described, and its distribution in South Dakota is discussed.

The life-history has been studied in cages both in and out of doors, and the results checked with actual field conditions wherever possible. The first appearance of the flies is largely regulated by the weather; they are usually seen at the end of May or during the first days in June. The eggs are laid preferably on the upper surface of the leaves close to the culm, upon the stems close to and above the leaf sheaths, or between the leaf sheaths and the stems. Under cage conditions they may be laid on almost any part of the plant or cage. The incubation period varies according to weather conditions, lasting from 4 to 11 days. The larvae upon hatching make their way into the plants, migrating downwards to where a leaf sheath clasps the stem and feeding on the latter. The stem is generally girdled before a node is reached. The severing of the fibro-vascular bundles causes a characteristic, dead, white head to develop. In young plants where the stem is not formed the larva migrates to the bulbous base above the root, where it feeds until it is full-grown. The duration of the larval period is 18–22 days. In the spring pupation occurs at the base of the young plants above the roots, in the older plants in the summer and autumn the larvae migrate upwards between the leaf sheath and stem and pupate an inch or less below the junction of the leaf blade and stem. Pupation lasts from 12 to 16 days. There are two full generations a year, and a large number of individuals produce a third generation. The winter is passed in the larval stage.

The most important natural natural enemy of *M. americana* is the Hymenopterous parasite, *Coelinidea meromyzae*, F.; others are *Microbracon meromyzae*, Gah., a mite, *Pediculoides ventricosus*, Newp., and an unidentified fungus.

Though these enemies destroy from 30 to 65 per cent. of their host during the year, they cannot be relied upon, and such measures as rotation of crops, trap-crops, destruction of self-sown plants and late planting of autumn grain should be applied.

Of various poison baits, the best results were obtained with ¼ U.S. pt. molasses, 1 U.S. gal. water, ¼ oz. sodium arsenite and ½ cake of yeast. The molasses, water and yeast are mixed and allowed to stand for 24–48 hours, fermented bait being more effective. The sodium arsenite is then added and the mixture sprayed over the wheat fields before 8 a.m. As, however, this bait needs to be applied over large areas at frequent intervals in order to be really effective, its cost is considered prohibitive under present conditions.

McATEE (W. L.). **Revision of the American Leaf Hoppers of the Jassid Genus** *Typhlocyba.*—*Proc. U.S. Nat. Mus.*, lxviii, art. 18, no. 2619, 47 pp., 6 pls. Washington, D.C., 1926.

The characters of the genus *Typhlocyba* are defined, and keys are given to the groups of species in this genus and to the species within them. A number of new species are described.

VICKERY (R. A.). U.S. Bur. Ent. **Observations on** *Cirphis latiuscula* **H. Sch., in the Gulf Coast Region of Texas.**—*Jl. Agric. Res.*, xxxii, no. 12, pp. 1099–1119, 3 figs., 14 refs. Washington, D.C., 15th June 1926.

Cirphis latiuscula, H.S., is known in tropical America, especially in Cuba and Porto Rico, as a pest of sugar-cane and other large grasses, but it has only once been recorded as injurious in the United States [*R.A.E.*, A, iii, 683]. Although it frequently occurs in sugar-cane fields (the moths have been reported from Texas, Arizona and New Mexico), it is not considered a serious pest of sugar-cane, but its economic importance lies in the fact that it may be concerned in army-worm outbreaks in the southern States, especially along the Gulf Coast.

The entire life-cycle from oviposition to the emergence of the adults requires from 40 to 50 days during October, November, March and April, and over 70 from December to February. There are about 6 generations a year. Details are given of rearing experiments, and the various stages are described. Notes are also given on the bionomics of the natural enemies, those not previously recorded [*loc. cit.*] being *Paniscus* sp., reared only from larvae collected on sugar-cane; *Microplitis varicolor*, Vier., reared from larvae taken on oats and barley; and the fungus, *Beauveria globulifera*.

FINK (D. E.). U.S. Bur. Ent. **The Biology of** *Macrocentrus ancylivora* **Rohwer, an important Parasite of the Strawberry Leaf Roller** (*Ancylis comptana* **Froehl.).**—*Jl. Agric. Res.*, xxxii, no. 12, pp. 1121–1134, 9 figs., 4 refs. Washington, D.C., 15th June 1926.

This is a detailed account of the biology and different stages of the Braconid, *Macrocentrus ancylivora*, Rohw., as observed under laboratory conditions. It was originally described from New Jersey [*R.A.E.*, A., xii, 55], where parasitism of *Ancylis comptana*, Froehl. (strawberry leaf-roller) reached 50–60 per cent. All the larval stages of the host are attacked, but development is slower in the younger stages than in the older ones. The eggs hatch in from 3 to 13 days, the larval stage lasts from 8 to 16 days, the prepupal stage from 24 to 36 hours, and the pupal stage 8 to 10 days. The adults live from 5 to 6 days, the number of eggs laid by each female ranging from 384 to 768. The winter is passed as a mature larva within the hibernating larval host. In New Jersey there are three generations a year, the first being the most abundant.

THATCHER (R. W.). **Forty-fourth Annual Report for the fiscal Year ended June 30, 1925.**—*New York Agric. Expt. Sta.*, 51 pp. Geneva, N.Y., 1926.

Much of the information in the entomological section of this report (pp. 34–41) has been noticed previously from bulletins and other sources. The most promising methods of controlling *Tortrix* (*Cacoecia*) *argyrospila*, Wlk. (fruit-tree leaf-roller) on apples are spraying with oil emulsions just before the eggs hatch and with arsenicals at intervals of 10 days during the hatching period.

Nicotine-lime dusts, 2, 3, or 4 per cent., were highly toxic to *Diabrotica vittata*, F. (cucumber beetle), provided that temperature was high and direct contact obtained, but caused considerable foliage injury; light applications of dust at lower temperatures, while not causing foliage injury, failed to control the beetles. Arsenical dusts were repellent rather than toxic to *D. vittata*, and dilutions of 1 to 15 or 20 gave better control than ones of 1 to 5, although the diluents, hydrated lime, gypsum, kaolin, and flour, alone were less effective. Zinc arsenite was slightly more toxic than lead arsenate or calcium arsenate, but caused severe injury when applied to damp foliage. Gypsum gave better results than the other diluents, but was only slightly superior to hydrated lime; it has the disadvantage of being rather heavy and not always readily discharged from the duster. Although in its physical properties hydrated lime was superior to the other diluents, plants dusted with it did not yield so well as those treated with dusts containing gypsum. Plants dusted with arsenical dusts gave better yields than those treated with nicotine-lime dusts, apparently mainly on account of the foliage injury and stunting caused by the latter.

In tests for the control of thrips and Aphids on cauliflowers in seed-beds, tobacco dust was superior to nicotine sulphate dust mixture containing 2 per cent. nicotine or nicotine sulphate spray, 1 pt. to 100 gals., and was as effective diluted with an equal weight of hydrated lime as alone. In laboratory tests tobacco dust was more toxic to *Myzus persicae*, Sulz., diluted with hydrated lime, than undiluted. A 2 per cent. nicotine-lime dust gave good control of thrips and Aphids in a field of young cauliflowers.

Lead arsenate, calcium arsenate and zinc arsenite, pure or diluted with hydrated lime, were repellent to *Epitrix cucumeris*, Harr. (potato flea-beetle) on potatoes, and in this respect were not superior to lime alone; when the beetles were brought into direct contact with the dusted foliage, calcium arsenate was the most toxic of the three arsenicals when used undiluted or diluted with 5–9 parts lime, while zinc arsenite was the most toxic diluted with 11–15 parts lime.

BENNETT (C. W.). **Arsenical Injury to Peach.**—*Qtrly. Bull. Michigan Agric. Expt. Sta.*, viii, no. 4, pp. 183–185, 1 fig. East Lansing, Mich., May 1926. [Recd. July 1926.]

Peach trees in Michigan have been seriously injured in recent years by spraying with arsenicals, which causes the dying of young shoots and buds, owing to the formation of a canker at the base of the new growth; cankers are also produced on the older wood, the bark cracks, and gum is exuded. Sometimes small areas in the leaves and the attachments of the fruit are injured; in the latter case the fruit does not develop well. To avoid this, lead arsenate should not be employed in excessive amounts in spray mixtures, and when it is being used in conjunction with lime and sulphur, these should be in equal proportions.

HORSFALL (J. L.). **The Life History and Bionomics of** ***Aphis rumicis.***—*Univ. Iowa Studies Nat. Hist.*, xi, no. 2, 57 pp., 9 pls., 99 refs. Iowa City, Iowa, 15th February 1925.

Previous literature on *Aphis rumicis*, L., is reviewed. This Aphid has been recorded under a number of different names, 19 of which are here given as synonyms. Studies on the biology have been extended over four seasons in Pennsylvania, during which time definite evidence has been secured as to the identity of forms occurring on widely dissociated species of food-plants at different periods of the year. Intermediates of viviparous females, oviparous females and males have been found and are described. Such apterous forms with traces of alate characters seem to indicate that the wingless forms evolved from the winged ones.

A. rumicis has a very wide range of food-plants to which a number are now added. These polyphagous habits may ultimately result in the formation of several physiological species that in time will exhibit distinctive morphological characters. The spring and autumn migrants are morphologically distinct. Cage experiments correlated with field notes have demonstrated two distinct types of life-cycle: one with woody shrubs as primary food-plants on which the eggs are laid and the first generations develop in the spring, the secondary food-plants being herbaceous; the other with primary food-plants such as *Chenopodium album* and *Rumex*, and these and other herbaceous plants as secondary food-plants.

The time elapsing between the birth of viviparous females and the first young varied from 7 days in July and August to 20 days in late October and November. The average length of the productive period was 12·6 days.

It is believed that the appearance of spring and autumn migrants is in some way connected with temperature conditions, though the problems as to what factor or combination of factors induces the appearance of winged forms could not be solved.

The following predacious and parasitic enemies were found :— *Asaphes americana*, Gir., *Lysiphlebus testaceipes*, Cress., *Pachyneuron siphonophorae*, Ashm., a Cynipid, *Aphidencyrtus* sp., *Bochartia* sp., *Megilla maculata*, DeG., *Adalia bipunctata*, L., *Hippodamia convergens*, Guer., and *Coccinella novemnotata*, Hrbst.

Starr (S. H.). **Boll Weevil Control Tests.**—*Georgia Coastal Plain Expt. Sta., 5th Ann. Rept. 1924*, Bull. 5, pp. 19–21. Tifton, Ga., 1st June 1925. [Recd. July 1926.]

Owing to the hot, dry season of 1924, which exerted considerable natural control over the boll weeevil [*Anthonomus grandis*, Boh.], the increase in crop resulting from the use of insecticides was not so great as in the previous year, which was wet. Very good results have however, been obtained by applying a syrup consisting of 3 lb. calcium arsenate, 1 U.S. gal. molasses and 3 U.S. gals. water to the growing points of the cotton plants with a hand mop, 7 to 10 days before the first squares appear, repeating the treatment two or three times a weekly intervals, and subsequently dusting with calcium arsenate The syrup would probably be more effective with an increased proportion of molasses, if this did not add too much to the cost.

A Common Corn Pest.—*Qtrly. Bull. State Plant Bd. Mississippi*, vi no. 1, pp. 17–19, 3 figs. A. & M. College, Miss., April 1926 [Recd. July 1926.]

Ligyrus (*Euetheola*) *rugiceps*, Lec. (round-headed corn stalk beetle is a common pest of maize in Mississippi in the neighbourhood of waste land or pasture, or on such land in the first year after it has been broken up for cultivation. The damage, which is mainly to young plants, i caused entirely by the adults, as the larvae feed on decaying vegetable matter. The life-history is briefly described [*R.A.E.*, A, vi, 484 xiii, 26].

Grasshoppers in Mississippi.—*Qtrly. Bull. State Plant Bd. Mississippi* vi, no. 1, pp. 19–20. A. & M. College, Miss., April 1926. [Recd July 1926.]

Nearly every year maize, cotton, lucerne, soy-beans [*Glycin hispida*], or other crops are severely damaged by grasshoppers in som part of Mississippi, especially in the Delta region. The most importan species is *Melanoplus differentialis*, Uhl., which occurs throughou the State; *M. femur-rubrum*, DeG., and *Schistocerca americana*, Drury are less injurious. A bait consisting of 20 lb. bran, 1 lb. Paris green o white arsenic, 2 U.S. qts. cheap molasses, 3 to 6 oranges or lemons, an 2 or more U.S. gals. water has been found very effective in controllin them, and is sufficient for 3 acres. When attacking cotton, grasshoppers may be controlled by dusting with calcium arsenate, a method that may also be employed when they are on grass or weeds ; in dusting maize or soy-beans calcium arsenate should be diluted with 9 parts slaked lime to prevent foliage injury ; 90 to 95 per cent. control has beeen obtained with this mixture.

FLANDERS (S. E.) **Note [on Codling Moth Parasites].**—*Pan-Pacific Ent.*, ii, no. 4, p. 185. San Francisco, Cal., April 1926. [Recd. July 1926.]

Aenoplex carpocapsae, Cush., and *Ephialtes sanguineipes*, Cr., have been found to be parasites of the codling moth [*Cydia pomonella*, L.]. *Dibrachys boucheanus*, Ratz., was also reared, but is apparently usually a hyperparasite, its primary host being *A. carpocapsae.*

DOANE (R. W.). **Controlling Mealybugs on Ornamental Plants.**—*Pan-Pacific Ent.*, ii, no. 4, pp. 213–214. San Francisco, Cal., April 1926. [Recd. July 1926.]

Of various sprays tried for the control of *Pseudococcus gahani* on ornamental plants in California the following has given the best results :—1 U.S. gal. "Volk" oil, 7½ lb. washing powder, ½ U.S. pt. 40 per cent. nicotine sulphate, and 50 U.S. gals. water.

The efficacy of the spray depends on the fact that the soap solution penetrates the secretions covering the mealybugs, thus enabling the nicotine to destroy them, and the oil makes the material more penetrating. It has been used on a number of plants and also proved successful against *P. aurilanatus*. As it also cleans away the sooty mould, it greatly improves the appearance of the infested trees. The spray was applied at 250–300 lb. pressure, and in some cases a second application was necessary.

MACDOUGALL (A. P.). **Some New Species of *Macrosiphum* from British Columbia (Homoptera, Aphididae).**—*Pan-Pacific Ent.*, ii, no. 4, pp. 165–173, 6 figs. San Francisco, Cal., April 1926. [Recd. July 1926.]

The new species described are *Macrosiphum audeni*, on *Nymphaea polysepalum* ; *M. bisensoriatum*, on *Ribes lacustre* ; *M. fuscicornis*, on *Epilobium angustifolium* in company with *Aphis oenotherae*, Oest. ; *M. nigromaculosum*, on *Rosa nutkana* ; *M. pyrifoliae*, on *Pyrus occidentalis* during the summer ; and *M. subviride*, on *Aster alpinus*.

MAHEUX (G.). **Report of the Provincial Entomologist.**—*Rept. Minist. Agric. Prov. Quebec 1924–25*, pp. 201–207, 2 pls. Quebec [1925]. [Recd. July 1926.]

The distribution of samples of sodium arsenite for the control of the onion maggot, *Hylemyia antiqua* (*Pegomyia ceparum*), has been very successful, both in familiarising farmers with the value of treatment with this insecticide and in the measure of control obtained. Energetic campaigns for the extermination of the gipsy moth, *Porthetria dispar*, have been carried out, and will be continued wherever an infestation occurs.

Robb (O. J.). **Control of Nematodes.**—*Ontario Dept. Agric., 21st Ann. Rept. Vegetable Growers' Assoc. 1925*, pp. 41–43. Toronto, 1926.

A general account is given of the injury caused by Nematodes. Of the large number infesting agricultural crops, the most common are *Heterodera* (*Caconema*) *radicicola*, *H. schachtii* and *Tylenchus dipsaci*. The various methods of control are discussed, including crop rotation (with the object of starving the pests) and heat. The latter is the most satisfactory measure in greenhouses, either steam or hot water being used; the methods of applying it are described.

Caesar (L.). **The Chief Insect Pests of Currants and Gooseberries.**—*Ontario Dept. Agric.*, Bull. 318, pp. 20–23, 3 figs. Toronto, April 1926. [Recd. July 1926.]

This article is a revision of one previously noticed [*R.A.E.*, A, ii, 512], and deals with the same insects. In certain years there is a partial third brood of *Pteronus ribesii*, Scop. (currant worm), but it is not of any importance; the insecticides now recommended for the control of this sawfly are a spray of 1½ lb. lead arsenate powder to 40 gals. water, lime-sulphur solution (1 : 40), or Bordeaux mixture (3 : 6 : 40) applied just before the blossoms open, and again just after the fruit is set, and, for the second brood, 1 oz. hellebore to 1½ gals. water. In spraying for the control of San José scale [*Aspidiotus perniciosus*, Comst.] and oyster-shell scale [*Lepidosaphes ulmi*, L.] soluble sulphur, 12–14 lb. to 40 gals. water, may be substituted for lime-sulphur solution.

Seamans (H. L.). **The Pale Western Cutworm.**—*Canada Dept. Agric.*, Pamphlet 71, 8 pp., 3 figs. Ottawa, June 1926.

Most of the information in this pamphlet on the life-history and control of *Porosagrotis orthogonia*, Morr. (pale western cutworm) has been noticed previously [*R.A.E.*, A, iv, 346; viii, 192; ix, 541; xi, 363]. This moth occurs throughout the Great Plains area of western North America, but is only a serious pest in the north-western part of this area, in Alberta and Saskatchewan, where the climatic conditions are particularly favourable to it. Stress is laid on the importance of leaving summer fallow fields undisturbed during August and the first half of September, so that the surface soil becomes hard and crusted, and consequently unsuitable for egg-laying. The use of poisoned baits or substances for treating seeds is not recommended, as the results obtained do not justify the expenditure.

Curran (C. H.). **The Identification and Control of Adult Lepidopterous Insects attacking Stored Products.**—*Sci. Agric.*, vi, no. 11, pp. 383–388, 6 figs. Ottawa, July 1926.

The correct identification of adult Lepidopterous pests of stored products is of considerable importance, and as it often has to be done from specimens with badly damaged wings, it is very useful to be able to make determinations from some structures less liable to damage; the male genitalia are most satisfactory for this purpose. The author gives a key to six species of moths that are actual or potential pests of stored products in Canada, using characters of the male genitalia only. *Ephestia kühniella*, Zell. (Mediterranean flour moth) is the most important of these, being found chiefly in flour mills, where the webs of the larvae frequently block the machinery. *E. elutella*, Hb., occurs occasionally in all parts of Canada, principally in nuts, but it has also been found infesting linseed in British Columbia. *E. cautella*, Wlk., may be a serious pest of shelled nuts and sometimes attacks dates, but does not usually survive the winter in Canada. *E. figulella*, Gregson, occurs only occasionally in imported figs. *Plodia interpunctella*, Hb. (Indian meal moth) is second in importance only to *E. kühniella* in Canada as a pest of stored products ; the larvae attack all kinds of grain, also nuts and dried fruit, and some grain products, but rarely occur in flour. *Sitotroga cerealella*, Oliv. (Angoumois grain moth), a serious pest of stored grain in the United States, frequently occurs in grain imported from South America, but has not become established in Canada, and is not likely to be so. *Pyralis farinalis*, L. (meal snout moth) attacks cereals damaged by moisture, but not clean stored grain ; it is not included in the key.

The same control measures are usually applicable to all pests of stored products ; in dealing with infestations of small quantities of foodstuffs in winter the most satisfactory procedure is to expose them to freezing in the open ; where the temperature falls below 0° F. a single night's exposure should be sufficient, but if it does not fall below 20° F. the exposure should extend to two or three days. During the summer infested foodstuffs should be heated in an oven to a temperature of 130–140° F. for one or two hours ; this treatment destroys all insects and does not damage flour. Nuts and fruit can be freed from insects by cold storage for a few weeks.

The most satisfactory means of controlling Lepidopterous and other pests in mills and warehouses is by heating to 120–130° F. for 12–18 hours ; all stages of the insects are killed by heat, while fumigation does not destroy the eggs ; a further advantage of heat over fumigation is that it penetrates further into the grain than the gases, and by inducing activity in the insects brings them to the surface, while fumigation tends to drive them into the grain. As the germinating power of seed grain may be damaged by exposure to 120–130° F. for more than six hours, grain intended for sowing should be passed slowly through a heating machine. The exposure of mills and warehouses containing flour and grain to freezing is an inexpensive and effective method of destroying pests of stored products that should prove of great value in Canada when the temperature falls below 0° F. The procedure to be followed in heating, freezing, and fumigation with hydrocyanic acid gas generated from sodium or potassium cyanide and sulphuric acid is described.

BODENHEIMER (F. S.). **Entomological Notes from a Visit to Emek Jesreel (15th-24th May 1926).** [*In Yiddish.*]—*Yedeoth, Proc. Agric. Expt. Sta.*, i, pp. 21–22. Tel-Aviv, Palestine, June 1926. (With a Summary in English, p. 28.)

The insect pests dealt with include *Hippotion* (*Chaerocampa*) *celerio* on vines ; *Laphygma exigua* occurring in great numbers and destroying cereals, *Sesamum*, and tomato fruit, and injuring vines, cabbage, onions, etc. ; and *Lixus ferrugatus*, which infested beet in large numbers.

Bodenheimer (F. S.). **An Outbreak of** *Chaerocampa celerio* **L. in Palestine.** [*In Yiddish.*]—*Zionist Organis. Agric. Expt. Sta. & Colon. Dept.*, Leaflet 15, 8 pp., 2 figs. [Tel-Aviv, Palestine, 1926.] (With a Summary in English.)

Hippotion (*Chaerocampa*) *celerio*, L., occurred in unusual abundance on vines from the end of April to the middle of May, when pupation began. There are 3 or 4 generations a year, but it is usually only numerous in the autumn after the grape harvest. No natural enemies of any importance were observed.

Bodenheimer (F. S.). **First Report on Tobacco Insects in Palestine.** [*In Yiddish.*]—*Zionist Exec. Agric. Expt. Sta. & Colon. Dept.*, Circ. 11, 42 pp., 9 figs. Tel-Aviv, Palestine, May 1926. (With a Summary in English.)

Many insects that usually attack other plants tend to occur on tobacco in Palestine. An account is given of the more important of these, with recommendations for their control. They include *Calliptamus italicus*, L., *Pyrameis cardui*, L., and *Ocnogyna loewi*, Z., which attack plantations adjoining uncultivated land ; *Gryllotalpa gryllotalpa*, L., *Heliothrips haemorroidalis*, Bch., and *Phthorimaea heliopa*, Lw., occurring in seed-beds ; *Agrotis* (*Rhyacia*) *pronuba*, L., *Euxoa puta*, Hb., *Melanotus robustus*, Er., *Cardiophorus subaenescens*, Rttr., *Cteniopus gibbosus*, Baudi, *Ablattaria arenaria*, Kr., and a number of Tenebrionids, causing injury to the plants during the first few weeks in the field, though the economic status of some of these beetles is uncertain ; *Myzus* (*Rhopalosiphum*) *persicae*, Sulz., occurring in the seed-bed and sometimes in large numbers in the field ; and *Anacridium aegyptium*, L., sometimes causing great damage in the field in May and June.

Peris (M. M.). **The Coconut Pest in South Canara.**—*Trop. Agriculturist*, lxvi, no. 6, p. 350. Peradeniya, June 1926.

Nephantis serinopa causes considerable damage to coconuts at Mangalore, Madras, by destroying the green tissues of the leaves. Infested fronds were cut and burnt, but the treatment, though effective in checking the moth, was too drastic for the health of the palms. Considerable success has recently been obtained by placing the infested fronds in wire gauze cages, so that the parasites only could escape. A Bethylid, Braconid, Elasmid and Eulophid have also been obtained from other districts. The last named attacks the pupa, the others being parasitic on the larva.

Holttum (R. E.). **Annual Report of the Director of Gardens** [Straits Settlements] **for the Year 1925.**—fol., 7 pp. Singapore, 1926.

Phenacoccus iceryoides, Green, continued to be very troublesome in Singapore, attacking a large number of plants, a list of which is given. Other Coccids were *Saissetia hemisphaerica*, Targ., on *Aphelandra velutina* and *Orthezia insignis*, Dougl., on many plants, particularly *Crossandra undulaefolia*.

MAHDIHASSAN (S.). **The Main Crop of Lac and the best Season for its Inoculation.**—*Jl. Sci. Assoc. Maharajah's Coll., Vizianagaram,* ii, no. 4, pp. 91–113, 36 refs. Madras, May 1926.

The following is part of the author's summary : Loss of larvae during swarming and mortality during larval stages reduce the population of a lac colony and affect both brood lac and lac crop. Mortality later in life makes brood lac scarce, but has little effect on the quantity of lac crop, *i.e.*, on the ultimate yield of shellac ; it is, however, useless for extracting lac dye. Mortality is associated more with drought than with excessive rains or heat or cold. Brood lac is scarcer early in the rainy season, even when the lac crop is larger. Moisture increases the size of the insect and encrustation, drought favours secretion layer. The lac crop is larger during the monsoons when the locality is dry or the food-plant non-succulent ; smaller when the habitat is humid or the food-plant succulent. The value of brood lac depends upon : (*a*) a better survival ratio or ratio between living and dead ; (*b*) a sex ratio in the issuing generation favourable to the female. The former decides the real quantity, the latter the quality of brood lac. In all cases sex-ratio is better and survival ratio less in the non-monsoon brood lac than in the other ; the choice lies between which is the greater limiting factor.

By far the most important consideration is the choice of a season during which mortality among the inoculated insects is low ; in all cases low mortality was found during the monsoons.

EGUCHI (M.). **Noctuidae infesting Sugar-beet.** [*In Japanese.*]—*Korea Agric. Expt. Sta.*, Bull. 3, pp. 257–263. Suigen, Korea, June 1926.

The Noctuids injurious to sugar-beet in Korea are *Agrotis ypsilon*, Rott., *A. c-nigrum*, L., *A. tokionis*, Butl., *Euxoa* (*A.*) *segetum*, Schiff., *Prodenia litura*, F. (*littoralis*, Boisd.), *Laphygma* (*Caradrina*) *exigua*, Hb., *Barathra* (*Mamestra*) *brassicae*, L., and *Phytometra* (*Plusia*) *eriosoma*, Dbl. Of these *L. exigua* is the most important and sometimes causes great damage.

KUWAYAMA (S.). **A List of the Insects injurious to Agricultural and Horticultural Plants in Hokkaido.** [*In Japanese.*]—*Hokkaido Agric. Expt. Sta.*, Bull. 42, 130 pp. Sapporo, June 1926.

The contents of this paper are indicated by its title ; some 226 pests are recorded.

GURNEY (W. B.). **Lantana Fly in the North Coast Districts.**—*Agric. Gaz. N.S.W.*, xxxvii, pt. 6, p. 477. Sydney, 1st June 1926.

Agromyza lantanae (lantana fly) and *Crocidosema lantana* (lantana moth) are now widespread in the north coast districts of New South Wales. While they probably exert some control in destroying the fruit and reducing the seed, sufficient still escapes to ensure a ready spread of the weed.

The flies are being liberated on an experimental plot to determine whether complete control can be anticipated. *A. lantanae* is also common in Sydney.

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JARVIS (E.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxv, pt. 6, pp. 497–498. Brisbane, 1st June 1926.

A brief account is given of the principal lines of investigation followed by the Division of Entomology of the Queensland Bureau of Sugar Experiment Stations since its inception in 1911. Although over thirty species of insects are sometimes injurious to sugar-cane in North Queensland, only about seven of these are serious pests; the work of the Division is mainly directed against *Lepidoderma albohirtum*, Waterh. (grey-back cockchafer), *Rhabdocnemis obscura*, Boisd. (weevil borer), *Lepidiota frenchi*, Blackb., and *Mastotermes darwiniensis*, Frogg. In some districts considerable damage has been caused by *Pentodon australis*, Blackb. (stem gauger), a Stratiomyiid, *Metoponia rubriceps*, Macq., and a wireworm, *Monocrepidius* sp., and these pests may become more serious and widespread in the future. Many control measures for *L. albohirtum* have been devised, but most of these have been abandoned, only soil fumigation to destroy the larvae and collection of the adults being generally practised; in connection with the latter method the use of trap trees to attract the beetles away from the sugar-cane and to facilitate their collection has been suggested, and some young trees of *Ficus pilosa*, a native fig especially attractive to them, have been raised with a view to distribution for this purpose.

MUNGOMERY (R. W.). **Report of the Southern Assistant Entomologist.**—*Queensland Agric. Jl.*, xxv, pt. 6, pp. 500–501. Brisbane, 1st June 1926.

Dipterous larvae and pupae frequently found in "dead hearts" of sugar-cane plants, caused by gumming disease, *Phragmatiphila truncata*, Wlk., or other agencies, are probably those of Micropezids; they do not attack the healthy plant tissue, and only appear after it has begun to decay. Larvae of a Rutelid have caused some damage, chiefly to young plants in land previously occupied by *Paspalum* grass but also in a few cases to young ratoons; injury by this beetle in newly broken up land has been avoided by planting arrowroot or beans as the first crop and collecting the larvae when these are ploughed up, planting sugar-cane the next year; the larvae attacking ratoon cane could probably be destroyed with carbon bisulphide, but only very small quantities of this fumigant should be used in treating young cane. A beetle that has injured eyes and shoots of cane in and near newly planted *Paspalum* land may be *Pentodon australis*, Blackb. [*cf. R.A.E.*, A, xiii, 19]. *Opogona glyciphaga*, Meyr., has been rather plentiful, and care should be taken not to plant seed cane infested with the larvae of this moth.

NEWMAN (L. J.). **Fruit Fly Destruction by Soil Insecticide.**—*Jl. Dept. Agric. W. Australia*, iii (2nd Ser.), no. 2, p. 183, 1 fig. Perth, June 1926.

The experiments described, for the control of fruit-flies [*Ceratitis capitata*, Wied.] by means of oil as a soil insecticide, were not successful, and it is doubtful whether it will ever be possible to deal with this pest by such means, as the presence of the growing plant limits the strength at which the insecticide can be applied.

NEWMAN (L. J.). **Winter Fruit-fly.**—*Jl. Dept. Agric. W. Australia,* iii (2nd Ser.), no. 2, p. 184. Perth, June 1926.

In view of the favourable conditions and consequent serious infestation by fruit-fly [*Ceratitis capitata,* Wied.] during the summer, growers are urged to continue measures against this pest throughout the winter and spring. By increasing the borax from 8 to 16 oz. in the pollard bait [*R.A.E.*, A, xii, 411], the effectiveness of the bait is prolonged, and it need only be renewed every 14 days.

SUTTON (G. L.). **Tests to determine the Presence of Arsenic in Apples after Treatment with Arsenical Sprays.**—*Jl. Dept. Agric. W. Australia,* iii (2nd Ser.), no. 2, pp. 221–225. Perth, June 1926.

In view of the recent statement by the British Ministry of Health that apples would be inspected at the docks and if they contained $\frac{1}{100}$ grain of arsenic in the pound, the consignment would be condemned, tests were made of apples sprayed in Western Australia. The results show that even under unusually drastic spraying conditions the amount of arsenic present was less than $\frac{1}{100}$ grain. In the case of apples sprayed once in early November with 12½ lb. lead arsenate in 100 gals. water, with flour as a spreader, and examined in February, the largest residual amount of arsenic was only $\frac{1}{8}$ of the minimum set by the British Ministry of Health. It was greatest where the largest amount of flour (5 lb. per 100 gals.) had been used as spreader. This amount is believed to be excessive, and growers are advised to use the minimum necessary for efficient results. In the case of apples sprayed five times with 6 lb. lead arsenate in 100 gals. water with a calcium caseinate spreader, the last spray having been applied in the third week of December, the amount of arsenic found varied between $\frac{1}{110}$ and $\frac{1}{800}$ grain per lb. In all the cases observed, the amount of rainfall after spraying was comparatively slight.

NEWMAN (L. J.). **The Orange Rust Mite** (*Phyllocoptes oleivorus,* **Ashmead**).—*Jl. Dept. Agric. W. Australia,* iii (2nd Ser.), no. 2, pp. 262–263, 2 figs. Perth, June 1926.

Phyllocoptes oleivorus, Ashm., is recorded for the first time from Western Australia. As a result of attack the oranges are spoilt in appearance and their commercial value reduced. As this mite is not yet widespread, it may be possible to exterminate it. Good results have been obtained with a spray consisting of 1 lb. atomic sulphur and 8 gals. water applied to the leaves and fruit. The addition of 3 lb. soap to every 80 gals. is recommended as a spreader.

LARRIMER (W. H.) & CARTWRIGHT (W. B.). U.S. Bur. Ent. **Determination of the Percentage of Infestation by the Hessian Fly,** *Phytophaga destructor,* **Say.**—*Jl. Agric. Res.,* xxxii, no. 11, pp. 1041–1044, 3 refs. Washington, D.C., 1st June 1926.

This and the following papers form a series in which it is hoped to present a partial solution of some of the questions that have arisen in a statistical study of *Mayetiola* (*Phytophaga*) *destructor,* Say, which was intended to supplement previous work [*R.A.E.*, A, xii, 307].

The authors' conclusions are as follows: In general practice in studies of Hessian fly infestation it is possible to take a sample that quite closely approaches a theoretically representative sample. In case a representative sample is taken, the probable error is determined by the number of culms taken and the percentage of infestation. Whatever the method of taking a sample, the probable error can be computed, and should be recognised and accepted as a part of the determination.

CARTWRIGHT (W. B.) & LARRIMER (W. H.). U.S. Bur. Ent. **Determination by the 5-square-yard Method of the Yield of Wheat Plots used in Studies of the Hessian Fly, *Phytophaga destructor*, Say.**—*Jl. Agric. Res.*, xxxii, no. 11, pp. 1045–1048, 3 refs. Washington, D.C., 1st June 1926.

This method consists in harvesting five separated areas, each one yard square, which, when taken together, represent $\frac{1}{968}$ acre. The authors' summary is as follows: Field harvests by the 5-square-yard method showed an error of sampling ranging from 6·3 to 13·8 per cent., and an average error of 10·3 per cent. of the computed average yields.

Other methods of harvesting limited areas did not prove superior in accuracy or in refinement of determination to the 5-square-yard method.

LARRIMER (W. H.) & NOBLE (W. B.). U.S. Bur. Ent. **Determination of the Percentage of Parasitism of the Hessian Fly, *Phytophaga destructor*, Say.**—*Jl. Agric. Res.*, xxxii, no. 11, pp. 1049–1051. Washington, D.C., 1st June 1926.

A possible method for the determination of the percentage of parasitism is discussed, as a result of which it is concluded that the percentage of parasitism of a sample lot of pupae of *Mayetiola* (*Phytophaga*) *destructor*, Say, with the appropriate probable error determined theoretically, may be safely taken as indicating the percentage of parasitism in the field.

BARBER (G. W.). U.S. Bur. Ent. **A Two-year Study of the Development of the European Corn Borer in the New England Area.**—*Jl. Agric. Res.*, xxxii, no. 11, pp. 1053–1068, 3 figs. Washington, D.C., 1st June 1926.

In order to obtain reliable information as regards the seasonal history of the European corn borer [*Pyrausta nubilalis*, Hb.] on which recommendations for control might be based, systematic field counts were made in 1922 and 1923. The examinations were mainly of pupation and emergence, as these are considered more reliable for the construction of seasonal charts than percentage counts of eggs and young larvae. Comparisons were also made on different food-plants, and the results are given. Development is usually somewhat more advanced in weeds than in maize on the same date, and considerably more advanced in the early sown maize than in that planted somewhat later.

It was found that by combining the accurate information of development obtained by field counts with details of the life of adults as obtained by studies of individuals in cages, a chart of seasonal occurrence could be constructed. It is thought that such a chart is a fairly accurate guide to follow in planning measures for the control of the insect.

SPENCER (H.). **Biology of the Parasites and Hyperparasites of Aphids.**—*Ann. Ent. Soc. Amer.*, xix, no. 2, pp. 119–157, 4 pls., 2 figs., 12 refs. Columbus, Ohio, June 1926.

These observations on the parasites and hyperparasites of Aphids were begun in North Carolina in 1920 and continued in Ohio in 1921 and 1922. The existing literature on the subject is reviewed, and the apparatus and methods employed in the rearing experiments are described.

The biological factors affecting the control of Aphids include the condition of the food-plant, fungous diseases, and predatory and parasitic insects, but their relative efficiency varies with the time of year and differences in weather conditions.

A general account is given of the bionomics of the Braconid parasites of the subfamily APHIDIINAE, which are by far the most important parasites of Aphids. A discussion of their habits, development and economic importance is based on a detailed study of five species, *Diaeretus rapae*, Curt., *Lysiphlebus testaceipes*, Cress., *Aphidius nigripes*, Ashm., *A. polygonaphis*, Fitch, and *Praon simulans*, Prov.

Most of the Chalcids of the genus *Aphelinus* are also parasites on Aphids, and a species bred from *Aphis pseudobrassicae*, Davis, proved to be *A. semiflavus*, How. The work done by the author in connection with this species substantiates in every essential respect the observations of Hartley [*R.A.E.*, A, xi, 164].

The hyperparasites dealt with are *Lygocerus niger*, How., *Asaphes americana*, Gir., *Pachyneuron aphidivorum*, Ashm., and *Xystus brassicae*, Ashm.

The interrelations between the hyperparasites, parasites, Aphids and plants are complicated, and are shown in a diagram.

GLASER (R. W.). **The Green Muscardine Disease in Silkworms and its Control.**—*Ann. Ent. Soc. Amer.*, xix, no. 2, pp. 180–192, 3 pls., 11 refs. Columbus, Ohio, June 1926.

During the summers of 1922–25 a number of silkworms became infested with a fungus, which proved to be *Metarrhizium anisopliae*. Records of this fungus in other insects are reviewed, and successful infection experiments with silkworms are described. Infection is not acquired by ingesting the spores, but by their lodging on the skin. An account is given of the disease from the time of infection to death and after. If the fungus can be kept from sporulating, its spread can be prevented.

FROST (S. W.). **Certain Genitalic Characters in** *Laspeyresia molesta*, **Busck, and** *Laspeyresia prunivora*, **Walsh.**—*Ann. Ent. Soc. Amer.*, xix, no. 2, pp. 198–200, 1 pl., 2 refs. Columbus, Ohio, June 1926.

The characters described permit of the separation of the adults of *Cydia* (*Laspeyresia*) *molesta*, Busck, *Enarmonia* (*L.*) *prunivora*, Walsh, and *C.* (*L.*) *interstinctana,* Clem., even when they are in a damaged condition, as when taken from bait-pails. The characters of both sexes are given, except in the case of females of *C. interstinctana,* which were not examined.

Mutchler (A. J.) & Weiss (H. B.). **Leaf-beetles of the Genus** *Galerucella* **known to inhabit New Jersey.**—*New Jersey Dept. Agric.*, Circ. 98, 16 pp., 1 pl., 5 figs., 12 refs. Trenton, N.J., May 1926. [Recd. August 1926.]

Brief notes are given on the distribution and life-history of *Galerucella* spp., as occurring in New Jersey, with a key to the species. Practically all of them may be controlled by spraying with lead arsenate, detailed instructions for which are given under the more injurious species. The most important is *G. luteola,* Muls. (elm leaf-beetle), which should be sprayed with 1½ lb. lead arsenate to 50 U.S. gals. water about the time the leaves are becoming full-grown.

Progress of Agricultural Experiments — 1925. Economic Entomology.—*New Hampshire Agric. Expt. Sta.*, Bull. 221, pp. 11–13. Durham, N. H., February 1926. [Recd. August 1926.]

The investigations in progress in 1924 [*R.A.E.*, A, xiii, 419] were continued during 1925. Only a small proportion of the second brood larvae of the European corn borer [*Pyrausta nubilalis,* Hb.] hibernates successfully in New Hampshire, and the adults produced by those larvae that do survive the winter are small and lay only a comparatively small number of eggs ; this apparently accounts for the fact that although *P. nubilalis* occurs over a wide area in the State, infestation is at present light. P. R. Lowry has studied the life-history of the stalk borer [*Papaipema nitela,* Gn.] ; the overwintering eggs hatch in the latter part of May and the larvae pass through eight or nine instars, pupating in August ; the adults emerge in September. Larvae have been found in 22 species of plants under field conditions in New Hampshire, grasses being preferred in the early instars.

McKinney (K. B.) & Milam (J.). **The Green June Beetle Larva in Tobacco Plant Beds.**—*U.S. Dept. Agric.*, Farmers' Bull. 1489, 5 pp., 4 figs. Washington, D.C., June 1926.

The practice of using tobacco plant beds for a number of years instead of a new one each season, which has become general in Tennessee, has been instrumental in causing considerable injury to the young plants by larvae of *Allorrhina* (*Cotinis*) *nitida,* L. (green June beetle). After the removal of the plants in the spring, the beds are covered with manure, straw and tobacco stalks to a depth of several inches. This covering, which is not removed until the autumn or winter, attracts the adult beetles for oviposition. The larvae feed on the decaying vegetable matter and then burrow from 8 to 15 inches into the ground for the winter, coming up to the surface again in the spring to complete their feeding ; it is in the spring that they injure the young tobacco plants by burrowing under them and throwing up earth. The life-history is briefly described [*R.A.E.*, A, x, 164].

Steaming or burning the beds after the larvae have gone into hibernation does not destroy more than a small proportion of them on account of the depth to which they burrow, but excellent control was obtained by broadcasting a bait consisting of 1 lb. Paris green and 25 lb. bran, at the rate of 10–12 lb. per 100 square yards in the autumn. Dusting the beds in autumn with 1 lb. Paris green or 3 lb. lead arsenate per 100 square yards also gave fairly good results ; lead arsenate is less effective than Paris green, but it remains active longer. A second application 7–10 days after the first may be desirable with either dust. Excellent control was obtained by pouring one teaspoonful of carbon bisulphide into holes 8–10 inches deep near the burrows of the larvae, but the method is expensive, as the gas probably does not penetrate more than 6–10 inches through the soil under field condtiions. Nitrobenzene and naphthalene were ineffective as repellents.

SCHENK (G.). **Cyanogas Calcium Cyanide for the Control of Insects infesting Grain in Storage Bins.**—*Res. Devmpt. Cyanogas Calcium Cyanide,* Sect. 3, pp. 37–69, 5 figs., 6 refs. New York, N.Y., American Cyanamid Company, 1926.

The following is taken mainly from the author's summary and conclusions. The experiments described in detail show that it is possible to fumigate a large bin of wheat by introducing Cyanogas calcium cyanide G [*R.A.E.*, A, xiv, 444] into it with the wheat at the time it is being filled. A special machine has been designed to enable applications of the gas to be made in this manner. The common beetles found in stored grain are killed both in the immature and adult stages, those dealt with in the present experiments being *Calandra* (*Sitophilus*) *granaria,* L., *C. oryzae,* L., *Tribolium confusum,* F., *T. castaneum,* Hbst. (*ferrugineum,* F.), *Silvanus surinamensis,* L., *Crypturgus pusillus,* Gyll., and *Rhyzopertha dominica,* F.

The dosage per 1,000 bushels of wheat is 25 lb. of the fumigant. When starting with empty bins 2 lb. should be dropped in before the grain is started. The exposure recommended is 72 hours. With the wheat flowing at the rate of 5,000 bushels per hour, 33·3 oz. of the fumigant should be allowed to run per minute ; this is equivalent to the above-mentioned dosage. The fumigation may be conducted at temperatures as low as 40° F. There is no danger from residual hydrocyanic acid gas ; the treated wheat does not retain any objectionable odour ; and its quality and baking properties or germination are not affected.

Insect Pests.—*38th Ann. Rept. S. Carolina Expt. Sta., 1924–25,* pp. 44–51, 5 figs. Clemson College, S.C., December 1925. [Recd. August 1926.]

The Mexican bean beetle [*Epilachna corrupta,* Muls.] has now spread throughout the centre of South Carolina and will probably occupy the entire area within a short time. There are apparently four generations a year, a normal one developing in about 29 days from egg to adult. Some of the remedial measures have already been noticed [*R.A.E.*, A, xiii, 262] ; in addition to these, good results have been obtained with a mixture of 1 part lead arsenate to 6 parts hydrated lime, or 1 part calcium arsenate, 1 part sulphur dust and 4 parts hydrated lime. The latter mixture has the advantage of controlling bean rust.

GARDNER (L. R.). **An Experiment on the Control of Nematodes.**—*Jl. Ent. & Zool.*, xviii, no. 2, p. 43. Claremont, Cal., June 1926.

Cyclamen plants infested with *Heterodera radicicola*, Greef, were successfully fumigated with paradichlorobenzene. From $\frac{1}{4}$ to $\frac{3}{8}$ inch of soil was removed from the top of the pots and from $\frac{1}{4}$ to $\frac{1}{2}$ oz. of paradichlorobenzene was applied to each plant. The soil was then replaced and pressed down. The treatment was done in a greenhouse, the plants being given the same amount of water as untreated ones. Three weeks after treatment the roots showed no sign of infestation, and when planted out they developed normally.

SMITH (R. H.). **The Efficacy of Lead Arsenate in Controlling the Codling Moth.**—*Hilgardia*, i, no. 17, pp. 403–453, 19 figs., 61 refs. Berkeley, Cal., May 1926.

This is a detailed account of laboratory experiments on the control of *Cydia* (*Carpocapsa*) *pomonella*, L., with lead arsenate sprays and dusts [*cf. R.A.E.*, A, xiii, 429; xiv, 248].

A loose light covering of a dust containing 90 per cent. sulphur and 10 per cent. lead arsenate was more effective in protecting the apples than a lead arsenate spray of 2 lb. to 100 U.S. gals. The loose dust interferes with the movement of the larvae over the apples, and they become poisoned by merely crawling over the dusted surface. Whether the poison is taken into the spiracles or swallowed has not been determined; an experiment with stained maize-meal definitely indicates that some of the particles are swallowed.

Experiments were also made by coating apples with waterproof ink, the results of which indicate that particles of the skin are sometimes, but not always, swallowed as the larva digs into the apple. This is important in connection with the efficacy of the film covering of lead arsenate in protecting apples. If the film is thin, a number of larvae (as many as 15 per cent.) will enter without swallowing any poison; the thicker the coating of poison the greater the chance that some will be swallowed.

Experiments made to ascertain the relative value of the spray on the leaves and bark as compared with that on apples showed them to be about equal, the percentage of larvae poisoned varying directly with the concentration of the spray.

BOURNE (A. I.). **Orchard Insect Pests of 1925.**—*Massachusetts Agric. Expt. Sta.*, Bull. 226, pp. 18–22. Amherst, Mass., January 1926. [Recd. August 1926.]

The situation with regard to the insect pests of orchards during 1925 is briefly reviewed. The more important pests included the plum curculio [*Conotrachelus nenuphar*, Hbst.], which is a serious pest everywhere, and cannot yet be successfully controlled; the apple tent-caterpillar [*Malacosoma americana*, F.], recorded throughout the State; the European red mite [*Paratetranychus pilosus*, C. & F.], occurring particularly where oil sprays had been omitted in the spring; the round-headed apple-tree borer [*Saperda candida*, F.], a serious pest, particularly in the western part of the State; the codling-moth [*Cydia pomonella*, L.]; and the apple maggot [*Rhagoletis pomonella*, Walsh]. The apple and thorn skeletoniser [*Hemerophila pariana*, Clerck], of which the larvae maturing in late July and early August are usually most injurious, caused little injury at this time; the later brood was more abundant than usual and caused a considerable amount of skeletonising, which, however, was too late to necessitate remedial measures. The San José scale [*Aspidiotus perniciosus*, Comst.] is apparently of little importance, as it is automatically controlled by the dormant oil sprays applied against the red mite.

A few local outbreaks of pests not usually occurring in abundance were recorded during the year, the pear midge [*Contarinia pyrivora*, Riley] attacking over 50 per cent. of the crop in some cases, and the dock false worm [*Ametastegia glabrata*, Fall.] boring into apples in the autumn.

Bourne (A. I.). **The Codling Moth in Massachusetts. Tests of Lime-Sulfur Solution and some of its Substitutes against San José Scale. Some Results from Spraying with Scalecide.**—*Massachusetts Agric. Expt. Sta.*, Bull. 226, pp. 33–40. Amherst, Mass., January 1926. [Recd. August 1926.]

The seasonal history of the codling moth [*Cydia pomonella*, L.] has been studied, and though it was at first thought that a large amount of the injury caused by larvae entering the side of the fruit was due to the second brood, it now appears that the late hatching individuals of the first brood are responsible for much of this damage. The post-calyx spray is, therefore, as important as the calyx application. The sprays should be applied very thoroughly, as the larvae have been noticed to feed on the foliage on their way to enter the fruit. Two or more applications after the calyx spray of either spray or dust, at intervals of two weeks, have given good results. The emergence of the first brood larvae varies in different years, but the appearance of the second brood is fairly constant regardless of the season. If only one application against this brood is to be made, the dust or spray should be applied early in August.

Lime-sulphur solution is recognised as the standard dormant spray for the control of San José scale [*Aspidiotus perniciosus*, Comst.], and the results of experiments here described show it to be superior to a number of proprietary sulphur compounds.

Experiments with a miscible oil (scalecide) against various insect pests gave promising results, and in no case was injury to any of the trees noticed. Its value varied for the different pests, but it was particularly effective as a dormant or delayed dormant spray for the control of the overwintering eggs of the European red mite [*Paratetranychus pilosus*, C. & F.].

Bourne (A. I.). **A Study of the Life History and Control of the Onion Thrips.**—*Massachusetts Agric. Expt. Sta.*, Bull. 227, pp. 48–51. Amherst, Mass., February 1926. [Recd. August 1926.]

The infestation of seed onions by the onion thrips [*Thrips tabaci*, Lind.] is usually the result of its migration from neighbouring fields of set onions, and generally occurs at the time the sets mature and are pulled, which coincides with the period of greatest activity of the pest, late July and early August.

Though calcium cyanide dust shows considerable promise, neither this nor nicotine dusts are completely satisfactory from the point of view of cost and effectiveness. Oil sprays do not spread well on onion leaves. The most satisfactory insecticide consists of ½ pt. nicotine sulphate (40 per cent.) to 100 gals. water (1 : 1,500) with the addition of 6–8 lb. potash fish-oil soap per 100 U.S. gals. The spray must be applied in a fine mist at a pressure of 125–150 lb. to penetrate to the axils of the leaves where the largest number of thrips are congregated. A second application made 7–8 days after the first is recommended.

Chittenden (F. H.) & White (W. H.). **The Melon Aphid and its Control.**—*U.S. Dept. Agric.*, Farmers' Bull. 1499, 16 pp., 16 figs. Washington, D.C., June 1926.

This bulletin is a revision of a previous one [*R.A.E.*, A, vii, 2] dealing with the life-history and control of *Aphis gossypii*, Glov. In addition to the remedial measures already mentioned, a 2 per cent. nicotine dust at the rate of 35 to 40 lb. an acre, applied at a temperature above 70° F. when the foliage is dry, will effectively control the Aphids.

Chambers (E. L.). **The San José Scale in Wisconsin.**—*Wisconsin Dept. Agric.*, Bull. 73, 8 pp., 2 figs. Madison, Wis., February 1926. [Recd. August 1926.]

This is a popular account of the life-history of the San José scale [*Aspidiotus perniciosus*, Comst.] in Wisconsin, with recommendations for its control, the latter including the use of lime-sulphur or oil sprays.

Sherwood (E. C.). **Raising the Community Score by Controlling Insects and Fungous Diseases.**—*W. Virginia Coll. Agric.*, Extens. Circ. 269 (revd.), 30 pp., 11 figs. Morgantown, W. Va., March 1926. [Recd. August 1926.]

This is a revised and enlarged edition of a circular on measures for the control of injurious insects and fungi previously noticed [*R.A.E.*, A, xii, 372].

Peairs (L. M.). **The Mexican Bean Beetle** (*Epilachna corrupta* **Muls. Family Coccinellidae).**—*W. Virginia Agric. Expt. Sta.*, Circ. 39, 7 pp., 4 figs. Morgantown, W.Va., June 1925. [Recd. August 1926.]

This is a popular account of the bionomics of *Epilachna corrupta*, Muls., with recommendations for its control. A more recent circular on control measures is noticed below.

Sherwood (E. C.). **Control of the Mexican Bean Beetle.**—*W. Virginia Dept. Agric.*, Circ. 64; *Extens. Div. Coll. Agric.*, Circ. 279, 4 pp., 2 figs. Morgantown, W. Va., March 1926. [Recd. August 1926.]

Formulae and instructions are given for various sprays and dusts recommended for the control of the Mexican bean beetle [*Epilachna corrupta*, Muls.], the most satisfactory of which are a spray consisting of 2 lb. calcium arsenate and 50 U.S. gals. Bordeaux mixture (4–4–50), a 20 per cent. calcium arsenate and Bordeaux dust, and a dust of 1 part calcium fluosilicate to 3 parts hydrated lime.

McDonald (R. E.). **The Report of the Entomologist.**—*18th Ann. Rept. Commiss. Agric.* [*Texas*] *1924–25*, pp. 16–18. Austin, Tex. [1925.] [Recd. August 1926.]

The local distribution of the pink bollworm [*Platyedra gossypiella*, Saund.] in Texas is discussed. Though it has not been recorded in serious numbers in certain colder districts, this is probably accidental, and not a result of climate, particularly as a serious outbreak has occurred in one locality in which it was thought that it could not flourish.

Robinson (J. M.). **Dusting Cotton with Calcium Arsenate for Boll Weevil Control (Progress Report).**—*Alabama Polytech. Inst. Agric. Expt. Sta.*, Circ. 51, 12 pp., 3 figs. Auburn, Ala., May 1926. [Recd. August 1926.]

Details are given of tests made in 1924 and 1925 for the control of the cotton boll weevil [*Anthonomus grandis*, Boh.] in Alabama. The preliminary tests in 1924 gave sufficient evidence to show the superior value of calcium arsenate dust over the sweetened poison, so that all further tests were made with the dust. To protect the young squares, dusting should begin when the infestation reaches 10 per cent. Three applications made at intervals of 4–5 days should be sufficient. An application just before the cotton begins to square is advisable when there are 20 or more weevils per acre. The infestation can be determined by counting all the squares on the plants until 100 is reached ; the number of punctured squares among these will give the percentage of infestation. If infestation is below 10 per cent., there is little or no advantage in dusting. About 6 lb. calcium arsenate to an acre are required for one application.

Hinds (W. E.). **Department of Entomology.**—*Ann. Rept. Agric. Expt. Stas. Louisiana State Univ. & Agric. & Mech. Coll. 1925*, pp. 19–27, 1 fig. Baton Rouge, La. [1926.]

As a result of experiments in poisoning the boll weevil [*Anthonomus grandis*, Boh.] an average increase of 523·5 lb. of seed cotton an acre was obtained on the treated plots as compared with untreated ones. From 5 to 10 applications of dust were made, with an average of 7, at an average rate of 6½ lb. calcium arsenate an acre. Dusting from aeroplanes produced results at least as good as those obtained with ground machines. Measures against the boll weevil have undoubtedly some direct effect in increasing infestation by the cotton plant aphis [*Aphis gossypii*, Glov.]. The latter may, however, be controlled by adding nicotine sulphate to the calcium arsenate dust [*R.A.E.*, A, xiv, 266]. This combined dust was also successfully applied against Aphids on turnips, mustard and similar crops and particularly on roses.

Experiments were made with various insecticides applied to sugar-cane by aeroplanes. One or two applications of calcium arsenate failed to kill any large proportion of sugar-cane borers [*Diatraea saccharalis*, F.]. Promising results were, however, obtained with sodium fluosilicate ; more than 90 per cent. of the larvae of all sizes were found dead on the leaves and within the stalks, and the killing effect apparently continued for a number of days after the application of the dust. No injury was caused to the sugar-cane by the application of undiluted sodium fluosilicate.

Quarantine on account of the European Corn Borer. Quarantine no. 4 (Third Revision).—*Wisconsin State Dept. Agric.*, Circ. 24, 3 pp. Madison, Wis., February 1926. [Recd. August 1926.]

This revision of the Quarantine against *Pyrausta nubilalis*, Hb., in Wisconsin is similar to the preceding one [*R.A.E.*, A, xiv, 161], the principal modification being that the entry of certain plants and plant products liable to harbour the borer, which was previously permitted between 1st January and 31st May, is now entirely prohibited.

Narcissus Bulb Quarantine. Notice of Quarantine no. 62 with supplemental Rules and Regulations.—*Qtrly. Bull. State Plant Bd. Florida*, x, no. 4, pp. 73–77. Gainesville, Fla., July 1926.

To prevent the spread of certain bulb pests, including the bulb-flies, *Merodon equestris*, F., and *Eumerus strigatus*, Fall., and the Nematode, *Tylenchus dipsaci*, Kühn, no bulbs of the genus *Narcissus* may be moved interstate in the United States, except after inspection and certification of freedom from infestation. Bulbs found infested must be sterilised by hot water, or other approved treatment. For the hot water treatment the bulbs should be immersed in water at 110°–111·5° F., for at least 2½ hours, syringed with cold water on removal from the steriliser, and dried if not intended for immediate planting. Vacuum fumigation with carbon bisulphide may be employed as an alternative treatment, if the bulbs are infested with bulb-flies only. Bulbs to be so treated must be first freed from dirt. Previous to the introduction of carbon bisulphide into the fumigation tank, a 27 inch mercurial vacuum should be produced. The dosage must be 2½–3 lb. per 100 cu. ft., and the time of exposure 1¾–2 hours from when the indicator on the vacuum gauge reaches zero. Bulbs, when removed from the fumigator, should be thoroughly aired, and should not immediately be brought into direct sunlight or wind. They should not be fumigated when the temperature is below 60° F., the optimum temperature being 70°–80° F.

Nursery Stock, Plant and Seed Quarantine. Conditions governing entry of Narcissus Bulbs under Regulation 14, Quarantine 37.—*U.S. Dept. Agric., Fed. Hortic. Bd., Service and Regulatory Announcements*, no. 86, pp. 8–9. Washington, D.C., June 1926.

The restriction on the entry into the United States of bulbs of *Narcissus*, which became effective 1st January 1926 as a result of Amendment no. 4 to Regulations supplemental to Quarantine no. 37 [*R.A.E.*, A, xiv, 162], prohibits unlimited commercial entry, but limited quantities may be imported under certain conditions and subject to inspection and treatment.

Fruit and Vegetable Quarantine. Addition to Quarantine no. 56.—*U.S. Dept. Agric., Fed. Hortic. Bd., Service and Regulatory Announcements*, no. 86, p. 9. Washington, D.C., June 1926.

The re-entry of fruits and vegetables of foreign origin, which have been permitted to proceed to Canada in bond *via* northern American ports is prohibited, except under permit.

Fruit-fly Surveys in Honduras, British Honduras and Guatemala.—*U.S. Dept. Agric., Fed. Hortic. Bd., Service and Regulatory Announcements*, no. 86, p. 10. Washington, D.C., June 1926.

Investigations in January 1926 as to the presence of insect pests of *Citrus* in Honduras showed the fruit-flies, *Anastrepha fraterculus* and *A. serpentina*, to be abundant, with lesser numbers of *A. striata*, *A. leptozona*, and *Euaresta timida*. Hog-plums (*Spondias* sp.), on the ground, were heavily infested with larvae of a species of *Anastrepha*, as were also fallen guavas in Guatemala. Oranges in Honduras, and oranges and grape-fruit [*Citrus decumana*] in British Honduras, all apparently in good condition, were attacked by a species of *Euxesta*.

WOGLUM (R. S.) & LA FOLLETTE (J. R.). **Handbook of Citrus Insect Control for 1926.**—*California Fruit Growers' Exchange*, Bull. 3, 17 pp. Los Angeles, Cal., July 1926.

This analysis of the value of sprays as compared to fumigation for the control of Coccids on *Citrus*, based on the results of the 1925–26 season, largely confirm those previously noticed [*R.A.E.*, A, xiii, 503, 511, 629 ; xiv, 405]. Where a single treatment is relied on for the control of red scale [*Chrysomphalus aurantii*, Mask.], it is best to give a heavy winter fumigation; the most dependable method, however, is an oil spray applied thoroughly in the autumn or winter and followed in a short time by a heavy fumigation. The spray is more effective against scales on the fruit, while fumigation kills more of those on the wood. This is recommended for the control of *C. aurantii* on lemons in the resistant districts. The relative values of the various proprietary oils and their effect on the grade and quality of the fruit are discussed. The latter varies in different oils, but though the highly refined white lubricating oil, which appears to be the most popular brand, causes the greatest losses of this nature, they may be prevented by making the applications early, 2–3 months before the fruit is picked.

Fumigation is the best method of controlling *C. aurantii* on oranges, on which the resistant scale problem is not so serious as on lemons. As it does not control red spider [*Tetranychus citri*, McGregor], oil sprays have been used on oranges in the coastal districts and have given good results against various Coccids. They have, however, in some cases caused the immature fruit to drop, affected the amount of blossom and fruit set, and retarded the colouration of the fruit.

Where the double treatment is necessary for the control of black scale [*Saissetia oleae*, Bern.] fumigation should be done early, followed by an oil and lime-sulphur spray in mid-autumn. Fumigation is also recommended for the control of the citricola scale [*Coccus pseudomagnoliarum*, Kuw.] and the purple scale [*Lepidosaphes beckii*, Newm.].

The effect of oil film sprays on lemons from the packing house standpoint is discussed by H. W. Nixon.

KELSALL (A.) & HOCKEY (J. F.). **Nova Scotia Apple Spray and Dust Calendars, 1926.**—*Canada Dept. Agric.*, Pamphlet 65, N.S., 7 pp. Ottawa, March 1926. [Recd. August 1926.]

The various materials to be used for dusting and spraying in apple orchards and their routine application are discussed. As a rule, better results may be obtained from sprays than dusts, but if thorough spraying cannot be done a sufficient number of times a dust should be used. In large orchards, where the expenditure is warranted, it is best to use both, the dust to be applied particularly during damp critical periods.

ROSS (W. A.). **The Pear Psylla and its Control.**—*Canada Dept. Agric.*, Pamphlet 66, N.S., 8 pp., 5 figs. Ottawa, March 1926. [Recd. August 1926.]

The various stages of *Psylla* (*Psyllia*) *pyricola*, Först. (pear psylla) are described. The adults hibernate under the rough bark of pear or any other trees in or near the orchard. The eggs are laid in March or early April, according to weather conditions, on the twigs, fruit spurs and smaller branches, mainly on the lower surface. They begin to hatch when the fruit buds break, the incubation period varying from 9 to 32 days according to temperature, with an average of about 3 weeks. The newly hatched nymphs feed chiefly on the leaf petioles and blossom stems, and are fully grown in about a month. There are four generations a year. The remedial measures, both cultural and mechanical, have already been noticed [*R.A.E.*, A, xiii, 584 ; xiv, 241].

SWAINE (J. M.) & HUTCHINGS (C. B.). **The More Important Shade Tree Insects of Eastern Canada and their Control.**—*Canada Dept. Agric.*, Bull. 63, N.S. (Ent. Bull. 28), 58 pp., 68 figs., 3 refs. Ottawa, April 1926. [Recd. August 1926.]

A general account is given of the control of insect pests of shade trees in Eastern Canada by such means as banding, hand picking and the use of poisons. In connection with the latter formulae are given for the usual sprays, such as lead arsenate, nicotine and oil emulsion. Special recommendations for their use are made under each pest dealt with. Some 70 species of insects are recorded, both popular and scientific names being given, with brief notes on their bionomics.

GIBSON (A.), GORHAM (R. P.), HUDSON (H. F.) & FLOCK (J. A.). **The Colorado Potato Beetle** (*Leptinotarsa decemlineata* **Say**) **in Canada.**—*Canada Dept. Agric.*, Bull. 52, N.S. (Ent. Bull. 27), 30 pp., 1 pl., 1 fig., 27 refs. Ottawa, August 1925. [Recd. August 1926.]

Leptinotarsa decemlineata, Say (Colorado potato beetle) was first recorded in southern Ontario in 1870, and since that time it has spread into all the provinces of Canada. The emergence of the beetles from the soil in the spring, about the end of May, is fairly constant from year to year in any one locality ; they begin to appear when the soil temperature reaches 22° C. [72° F.], and emergence extends over a number of days on account of the varying depths at which they hibernate.

When the beetles have emerged, they fly almost immediately to the nearest field of potatoes, being apparently able to go directly to it; in one instance a field 200 yards from the place of emergence of a large number of beetles was heavily infested for a week before another field a quarter of a mile away; large plants are preferred to small ones. Mating may take place on the same day as emergence provided that the beetles have fed, but does not take place at all before feeding; both sexes may mate several times at short intervals. Eggs are usually laid three days after mating, and it is probable that females that lay fertile eggs on the day of emergence have been fertilised prior to hibernation, as it has been found that fertile eggs may be laid by females that have laid eggs in the previous year, or by those that have been fertilised before hibernating, but have not laid any eggs. In New Brunswick, where there is only one generation a year, females do not mate before going into hibernation, but males will mate with females of the previous generation before hibernating. Although females may mate almost every day of their active life, they are capable of laying fertile eggs for a month when no males are present.

In the spring most of the eggs are laid on the largest potato leaves, which are near the ground, but later in the season they are mostly laid on the leaves near the middle of the plants where they are densest. The egg-masses contain on an average about thirty eggs, and a female usually lays two with an interval of one or more days after each and then from 5 to 9 on consecutive days; after this there is a resting period during which a few masses may be laid at irregular intervals and another period of greater activity, which may be followed by another resting period and a third period of activity. The method of oviposition, the eggs and the hatching of the eggs are described; at Ottawa the eggs hatch in 5–10 days in June with a mean temperature of 71° F., while in New Brunswick they hatch in 14–17 days with a mean temperature of 58° F.

The larvae on hatching feed on the lower surface of the leaf, but after about a day they move to the young leaves at the top of the plant and feed on the upper surface for two days before the first moult; the first instar thus lasts about three days at Ottawa, but extends to five days in New Brunswick; after the first moult the older leaves are eaten; the second and third instars last about three days each and the fourth, during which the greatest amount of food is eaten, about six days. The total area of leaf tissue eaten by 10 larvae between hatching and pupation was 43·09 square inches, the estimated weight of which was 7·99 gms. It is estimated that in a normal infestation there are 140,000 larvae to an acre by 13th June, 320,000 a week later, and 250,000 during July. The larvae do not move from the plant upon which they hatch unless they are overcrowded.

When full-fed the larvae burrow into the soil to a depth of a half to six inches and construct an earthen cell in which they remain dormant for 3–5 days before pupating; in hard soil they make use of any crack or crevice to enter the earth; at Ottawa the pupal stage lasts 13–15 days; in New Brunswick in 1921 it lasted 7–11 days.

The beetles are most active on warm bright days, and they are capable of flying distances up to 20 miles. They feed on various plants other than potato and are minor pests of tomato and egg-plant; a

list of the recorded food-plants of the adults in Canada is given. I
Manitoba the larvae feed on *Solanum triflorum*, and this beetle i
therefore able to persist in the absence of potato plants. At th
beginning of the season, females outnumber the males, but in Augus
the position is reversed. The average active feeding period is 35 day
for beetles that emerge in the spring and 25 days for those of the summe
generation. The number of adult beetles to an acre on potatoes a
Ottawa in 1919 was estimated at 15,000 during June and 1,000,00
at the end of August.

At Ottawa there are two generations a year; in 1919 the adult
that emerged from hibernation laid eggs between 6th June an
16th August; the adults from these eggs began to emerge on 12th July
and the females laid eggs from 18th July to 6th September, producin
adults that began to emerge on 29th August, but did not lay egg
before going into hibernation in September and October; beetle
of the first generation and some that have already passed one winte
also hibernate. Adults of the first summer generation begin to g
into hibernation in July and those of the second in September. I
damp, cold clay-loam the beetles do not burrow more than 6 inche
down to hibernate, but in sandy soil they penetrate to a depth o
more than 14 inches. In New Brunswick and Nova Scotia there i
only one generation a year, and the average time from egg-laying t
emergence of the adults is 58 days.

During cold and damp weather the adult beetles frequently eat th
eggs that have been laid, sometimes to such an extent as to hav
considerable effect in controlling the pest. The Pentatomids, *Perillu*
circumcinctus, Stål, and *P. bioculatus*, F., a Carabid, *Lebia grandis*
Hentz, and a Coccinellid, *Anatis quindecimpunctata*, Ol., are predator
of some importance. The only parasite found by the authors in fiv
years was the Tachinid, *Phorocera doryphorae*, Riley, which occurre
only in very small numbers. In 1919 egg-masses were found coate
with a fungus, *Mucor* sp., which may not, however, have been th
primary cause of the failure of the eggs to hatch. Various birds fee
both on the larvae and on the adults. In some districts the presenc
of snow on the ground in the winter is of great importance to th
hibernating beetles, and in Manitoba in the winter of 1923–24 ove
90 per cent. were killed by frost owing to lack of protection by snow

The best methods of controlling *L. decemlineata* depend upon severa
factors; where potato blight is prevalent, insecticides should b
combined with Bordeaux mixture, and spraying is preferable to dustin
where practicable, but where blight is of slight importance dustin
is usually more economical. In using arsenicals, approximately 1 lb
or slightly less metallic arsenic should be applied to 1 acre of full
grown potatoes. In spraying 100–120 gallons of spray should be use
to an acre; the sprays recommended are 2 lb. lead arsenate (powder)
1½ lb. calcium arsenate, or ½–¾ lb. Paris green and 2 lb. quick lime
to 40 gals. water; in conjunction with Bordeaux mixture (6 lb. coppe
sulphate, 4 lb. unslaked lime, 40 gals. water) sodium arsenate, sodium
arsenite or calcium arsenate is generally used. The dusts recommende
are 8 per cent. calcium arsenate and 92 per cent. hydrated lime, o
80 per cent. hydrated lime and 12 per cent. dehydrated copper sulphate
used at the rate of 50 lb. an acre; a more concentrated dust consistin
of 25 per cent. dehydrated copper sulphate, 15 per cent. calcium arsenat
and 60 per cent. hydrated lime, used at the rate of 25 lb. an acre, i
effective, but does not usually adhere so well in the smaller quantity

MACDOUGALL (A. P.). **An American Species of the Genus *Pachypappella* Baker (Hom. Aph.).**—*Bull. Brooklyn Ent. Soc.*, xxi, no. 3, pp. 119–123. Lancaster, Pa., June 1926.

The stem-mothers and alate viviparous females of *Pachypappella caudelli*, sp. n., are described. This Aphid is common in the interior of British Columbia on *Populus trichocarpa* and *P. tremuloides.* It is also recorded from Illinois. Large galls are formed, the whole leaf becoming a globular-shaped mass. The colony is generally attended by *Formica fusca*, L. The history of this genus and of *Pachypappa*, Koch, is discussed, and a key is given to the species belonging to them.

GOWDEY (C. C.). **Report of the Government Entomologist.**—*Jamaica: Ann. Rept. Dept. Agric. 1925*, pp. 10–12. Kingston, 1926.

Owing to the greater care being shown by growers in trapping and the destruction of old corms, the situation with regard to *Cosmopolites sordidus*, Germ. (banana borer) continues to improve.

Diatraea saccharalis, F. (sugar-cane moth borer) was not greatly in evidence, probably as a result of the activities of the egg parasite *Trichogramma* (*Pentarthrum*) *minutum*, Riley, during the previous year. *Pseudococcus sacchari*, Ckll. (sugar-cane mealybug) was found on sugar-cane on several occasions; it seldom occurs on Uba cane, which, however, is attacked by *Sipha flava*, Forbes. Larvae of *Cirphis latiuscula*, H.Sch., and *C. humidicola*, Gn., were observed feeding on the leaves of sugar-cane.

Other pests were *Strategus titanus*, F., on coconut; *Epitrix parvula*, F., on tobacco; *Odonaspis* (*Froggattiella*) *pimentae*, Newst., and *Aleurodicus pimentae*, Lg., on pimento; *Euscepes batatae*, Watrh., in sweet potatoes; *Lepidosaphes beckii*, Newm. (purple scale) and *Pinnaspis* (*Hemichionaspis*) *minor*, Mask. (snow scale), still the most serious pests of *Citrus*; and *Aphis gossypii*, Glov. (cotton aphis), on sour oranges. *Aleurocanthus woglumi*, Ash. (citrus black fly) was attacked by the fungi, *Aschersonia goldiana*, *Aegerita webberi*, *Podonectria coccicola* and *Sphaerostilbe aurantiicola*. *Silvanus surinamensis*, F., attacked dried bananas; it probably gained access to them during packing or when exposed on sale.

The results of a number of tests with various proprietary insecticides are reported on.

MYERS (J. G.). **Dry-season Studies of Cane Homoptera at Soledad, Cuba.**—*Contrib. Harvard Inst. Trop. Biol. & Med.*, iii, pp. 69–110, 2 figs., 55 refs. [Cambridge, Mass.] 14th June 1926.

This report deals with the more immediately economically interesting Homoptera collected at Soledad during February, March and April 1925, with special reference to sugar-cane and its mosaic disease. The author has attempted to correlate the results of his observations with published work carried out elsewhere and to clarify the taxonomy of the Homoptera dealt with in the bulky literature on West Indian sugar-cane insects. A list is also given of Coccids collected in the district, chiefly from cultivated or other useful plants.

Mosaic disease is believed to be generally distributed throughout the island of Cuba, but the question of possible vectors has not hitherto been dealt with.

The feeding habits of the Rhynchota in general are discussed. There is a marked difference between the Heteroptera and Homoptera. In the former general feeders with a few exceptions are rare, whilst in the latter they are common, the choice of a given food-plant being probably influenced by environmental factors. The bearing on the cane-leafhopper question of the principles involved are obvious. The botanical factor in the food-plant preferences of insects is beyond the control of the cultivator, but the environmental conditions are amenable to alteration within certain wide limits, the degree of moisture appearing to be an important one as regards the Cuban cane leafhoppers.

The following are the only species that under dry-season conditions can properly be termed sugar-cane Homoptera at Soledad: *Kolla similis*, Wlk. (common green leafhopper); *Oliarus franciscanus*, Stål (black leafhopper); *Myndus crudus*, Van D. (pallid cane leafhopper); *Stenocranus* (*Saccharosydne*) *saccharivorus*, Westw. (West Indian cane leafhopper); *Phaciocephalus cubanus*, sp. n. (tawny leafhopper), the commonest and most widespread leafhopper on sugar-cane and also found on a number of other plants; *Sipha flava*, Forbes (yellow cane aphis); *Pseudococcus sacchari*, Ckll. (pink cane mealybug); *Ripersia* sp. (cane root mealybug); and *Targionia sacchari*, Ckll. (cane-stalk scale-insect). Other species recorded that are either obviously relevant to the mosaic question or have been recorded from sugar-cane elsewhere and are common at Soledad on other food-plants are *Draeculacephala minor*, Wlk., *Peregrinus maidis*, Ashm. (corn leafhopper) and *Aphis maidis*, Fitch (corn aphis).

The last two, known to transmit mosaic elsewhere (though not to sugar-cane in the case of *P. maidis*), have only been found by the author on maize and *Sorghum*. There is a much stronger probability at Soledad than elsewhere that *A. maidis* has little to do with secondary spread of mosaic under field conditions. It is questionable whether there is need for any other factor than diseased seed-pieces to explain most of the present distribution of mosaic at Soledad.

SALT (G.). **Report on Sugar-cane Borers at Soledad, Cuba.**—*Contrib. Harvard Inst. Trop. Biol. & Med.*, iii, pp. 9–62, 4 pls., 38 refs. [Cambridge, Mass.] 14th June 1926.

Among the insect pests of sugar-cane in Cuba, the most important from an economic standpoint are those known as " borers ". Observations were made on four of these, belonging to three different orders, *viz.*: *Diatraea saccharalis*, F. (sugar-cane moth borer), *Metamasius sericeus*, Oliv. (weevil borer), *Xyleborus* sp. probably *perforans*, Woll. (shot-hole borer), and *Nasutitermes morio*, Latr. Brief notes are given on the appearance and bionomics of these pests, so that they can be recognised in the field. The relative value of field and mill counts to determine borer infestation is discussed; though both admit of a certain amount of error, the mill count is very accurate as a means of determining the infestation of canes arriving at the mill and is likely to be used as the chief source of information as to the prevalence of borers in Cuba.

Of all the cane reaching the mills 19·42 per cent. is infested by borers, *D. saccharalis* accounting for 18·49 per cent. The larger the percentage of infestation of canes in a field, the greater is the number of internodes of the individual canes bored. Infestation in different localities of Soledad varies from 5·7 to 33·66 per cent. as shown by mill counts, the mill count being always below the actual prevalence in the field. As the rainfall, variety of cane grown and cultural measures were uniform in the districts examined, other factors had to be considered as responsible for these variations. Infestation by *D. saccharalis* is greater in the valleys than in the high lands, and this is perhaps due to the more succulent growth in the valleys during the dry season, particularly during January, being more attractive to the ovipositing moths. The losses due to *D. saccharalis* are of two kinds: field losses, which reduce the tonnage of yield and include losses due to seed-piece infestation (decreased germination, etc.), those due to stalks killed, loss in size and weight of stalks, and indirect losses due to borer attack ; and mill losses, such as the decrease in the sugar content of the cane, which becomes apparent during the milling operation. These losses are discussed in detail. The enormous damage done by the borer may be easily realised when it is pointed out that with an infestation of 18·49 per cent., a loss of 15·22 per cent. of the sugar in the bored canes, and a crop of 120,623 bags, Central Soledad lost 3,493 bags of sugar during the crop of 1924–25, solely because of the decrease of sugar content in canes injured by *D. saccharalis* The moth borer also probably exerts great influence on the general purity of the juice. The infestation of different varieties of cane is briefly reviewed.

About 3·5 per cent. of the infested stalks contain *Euzenilliopsis* (*Lixophaga*) *diatraeae*, Towns. ; though this parasitic fly undoubtedly accounts for large numbers of its host, it cannot be said to be controlling the borer in Soledad. Two fungi were observed on the larvae of *D. saccharalis* in a few instances, one being presumably *Isaria barberi*.

The remedial measures are summarised as follows : Borer-free seed cane should be selected by more careful examination by the cutters ; it should come from a field free from borers, and from cane grown on hills or slopes ; it should be planted deeply (2–3 inches) ; dead hearts should be removed from badly infested fields ; badly infested fields and low-lying lands should be cut early in the crop ; all canes should be sent to the mill and ground ; the growing of maize among sugar-cane should be discontinued, and the stalks of all maize grown should be carefully destroyed ; burning off should not be practised, as it may destroy parasites, and is not an efficient method of killing borers in stalks.

Metamasius sericeus is more prevalent at Soledad than was previously supposed or than mill surveys show, and is considered to be sufficiently numerous to be looked upon as a serious pest. As much as 8 per cent. of all the sugar-cane is attacked by this borer, and almost all cane attacked succumbs to the injury. The best remedial measures are the careful collection and milling of all stalks and the removal of dry infested stalks from the field.

The injury by *Xyleborus* sp. is practically negligible, as is also that by termites, though the latter may be more injurious to sugar-cane planted for seed.

In appendices, a list is given of the parasites and predators recorded in the literature as attacking *Diatraea saccharalis*, and the ants inhabiting its borings in sugar-cane in Cuba are briefly discussed.

Molina (E.). **Fórmula Molina para combatir diversas cochinillas y otros insectos.** [The Molina Formula for combating various Coccids and other Insects.]—[*Argentina :*] *Minist. Agric.*, [Circ.] no. 632, 10 pp., 9 figs. Buenos Aires, 15th July 1926.

The original formula [*R.A.E.*, A, iv, 18] has been modified as follows : wheat flour 60 lb., kerosene 3 gals., soap 10 lb., water 100 gals. The spray must be prepared on the day of use.

da Costa Lima (A.). **Sobre as moscas das fructas que vivem no Brazil.** [Fruit-flies in Brazil.]—*Chacaras e Quintaes*, xxxiv, no. 1, pp. 21–24, 2 figs., 11 refs. S. Paulo, 15th July 1926.

The fruit-flies found in Brazil include *Anastrepha fraterculus*, Wied., *A. serpentina*, Wied., *A. grandis*, Macq., and *Lonchaea pendula*, Bezzi, which are native species, and *Ceratitis capitata*, Wied., which has been imported. Coffee berries seem to be the preferred breeding-place of the last-named in Brazil, where the oranges do not appear to present conditions very favourable to it. *A. fraterculus*, of which *A. bistrigata*, Bezzi, is believed to be a variety, is the principal fruit-fly pest of fruits. It has been recorded as destroying 80–90 per cent. of the fruits of cassava (*Manihot utilissima*). *A. grandis* has been obtained from watermelon, cucumber and other cucurbits. It pupates in the ground, the pupal stage lasting 20–26 days.

da Costa Lima (A.). **A proposito de uma communicação do Dr. Puttemans sobre o Mosaico da canna de assucar.** [Regarding a Communication of Dr. Puttemans on Sugar-cane Mosaic.]—*Chacaras e Quintaes*, xxxiv, no. 1, pp. 30–32. S. Paulo, 15th July 1926.

Thrips minuta, van Dev., var. *puttemansi*, n., is found in the interior of the leaf-sheaths of sugar-cane exhibiting symptoms of mosaic disease in Brazil. In a communication made in June 1926 to the Brazilian Plant Protection Service Dr. A. Puttemans suggested that the mosaic symptoms are either due to an infectious disease carried by the thrips, or are simply the results of the lesions produced by the thrips while the leaves are still rolled up. A point in favour of the latter alternative is an observation that if the outside leaves of an infested sheath are removed, the new leaves in the interior regain their uniform green colour, and the plants become normal after showing evident signs of mosaic. If this is the case, it may be possible to combat the thrips by stripping off the outer leaves.

Fullaway (D. T.). **Annual Report [of the Entomologist] 1925.**—*Hawaiian Forester & Agric.*, xxiii, no. 2, pp. 47–48. Honolulu, April–June 1926.

Considerable work has been done in the search for parasites of the Japanese beetle [*Adoretus sinicus*] in Formosa, and their introduction is to be continued until they are established. Fruit beetles, *Carpophilus* spp., have become pests of some importance on pineapples. The Encyrtid, *Anagyrus dactylopii*, parasitic on *Pseudococcus filamentosus*, has been introduced and become established. *Casca chinensis*, a parasite of *Chrysomphalus aonidum*, was introduced at the same time, but its establishment has not yet been ascertained.

In addition to the Chalcid, *Euplectrus* sp., and the Tachinid, *Archytas* sp., an Ichneumonid, *Campoplex* sp., has been fairly prevalent as an enemy of army-worms ; it appears to be a natural immigrant.

Other beneficial insects liberated during the year were : *Diachasma tryoni* (3,250), *D. fullawayi* (350), *Opius humilis* (600), and *Tetrastichus giffardianus* (10,500), all parasites of the fruit-fly [*Ceratitis capitata*] ; *Opius fletcheri* (21,720), a parasite of the melon fly [*Dacus cucurbitae*] ; *Philonthus erythrocephala* (2,450), predacious on dung flies [? *Lyperosia*]; *Cleothera bromelicola* (6,010), *Scymnus pictus* (3,965), *Pullus uncinatus*

(3,420), *Exochomus nigromaculatus* (516), a small species of *Diomus* (1,475), and a large species of *Diomus* (250), predacious on mealybugs [*Pseudococcus*]; *Euplectrus platyhyphenae* (31,200), an army-worm parasite; and *Calosoma* sp. (284), predacious on army-worms.

EHRHORN (E. M.). **Report of Chief Plant Inspector, March-April 1926.**—*Hawaiian Forester & Agric.*, xxiii, no. 2, pp. 48–50. Honolulu, April–June 1926.

The pests intercepted include: From China, *Ailomorphus rhopaloides*, Wlk., in bamboo brooms; from Japan, *Ceroplastes ceriferus*, And., on *Nandina domestica*, and *Aulacaspis pentagona*, Targ., on sandpears [*Pyrus sinensis*]; from California, *Pseudococcus* sp. on bananas, *P. adonidum* (*longispinus*) (?) and an Aphid on gladiolus bulbs, *P. gahani*, Green, and wireworm larvae on dahlia bulbs, and an Aphid on strawberry plants; from New York, mealybugs on *Begonia*; from Pennsylvania, mealybugs on *Passiflora princeps* and *Clerodendron balfouri*, and weevil larvae in seeds of *Quercus tinctoria* and *Q. coccinea*; and from New Jersey, *Coccus* (*Lecanium*) *pseudohesperidum*, Ckll., on orchids, and ants on packing around them.

JANISCH (E.). **Ueber das Exponentialgesetz und seine Bedeutung für die Pflanzenschutzforschung.** [The Law of Exponents and its Importance in Research on Plant Protection.]—*Verh. Deutsch. Ges. angew. Ent., 5. Mitgliederversamml. Hamburg 16. bis 20. Sept. 1925*, pp. 55–67. Berlin, 1926.

The mathematical law of exponential equations which, according to the author, rules all biological processes, is briefly explained and illustrated by curves and formulae. It is considered that this law may be very profitably applied to the solution of various research problems on insect pests.

SCHULZE (H.). **Ueber die Fruchtbarkeit der Schlupfwespe** *Trichogramma evanescens* **Westwood.** [On the Fertility of the Hymenopterous Parasite, *T. evanescens*.]—*Zeitschr. Morph. u. Oekol. Tiere*, vi, no. 3, pp. 553–585, 2 figs., 11 refs. Berlin, 29th July 1926.

Trichogramma evanescens, Westw., is a parasite of the eggs of 67 recorded hosts, including 20 that are of economic importance. The experiments described here were made with eggs of the meal moth [*Ephestia kühniella*, Zell.] to ascertain the average fertility of a female under varying conditions.

At 25° C. [77° F.] and under the most favourable conditions the average number of host eggs successfully parasitised (progeny) was 35·6 per female; eggs that were punctured but still hatched averaged 40·2; and punctured eggs that died during development averaged 7·6. The average progeny of females fed on diluted honey was 25 during the first two days of life, this figure being 15·7 for unfed females, all of which died on the second day. At 25° C. [77° F.] the adult life of the parasite averages 13 days, whereas at 32° C. [89·6° F.] it seldom exceeds 1 day. A temperature of 15° C. [59° F.] appears to be about the lowest at which oviposition occurs. A temperature of 32·3° C. [90·14° F.] is the maximum at which larvae can hatch and develop, but the female is capable of puncturing host-eggs at a temperature of 34·5° C. [94·1° F.]. The optimum temperatures for oviposition and for number of generations lie between 27° and 27·5° C. [80·6–81·5° F.], but the normal temperatures in Germany permit of a number of generations sufficient to effect a valid check on the host. As regards the influence of changes of temperature it was found that the females survived one single sharp drop of 15·7° C. [28·26° F.], and that a number of hosts were still parasitised. Even after the temperature had been raised again and reduced twice *T. evanescens* was able to lay a few healthy eggs. From various experiments it seems likely that *T. evanescens* hibernates in the larval or pupal stages within its host.

It was found that the younger host eggs are much more readily parasitised, eggs one day old being preferred at 25° C. [77° F.]. As the out-door summer temperatures in Germany fall below this, the host eggs develop more slowly and must be exposed to attack for a longer period. In the literature the development of several parasites in one host egg has been repeatedly recorded, but in these experiments it was only exceptionally that two parasites developed from one host egg.

All the data given above refer to fertilised females. Further experiments showed that whereas the number of the progeny of fertilised females averaged 35·6, this figure rose to 41·6 in unfertilised individuals, but only males were produced by them.

In biological control work the release of newly-emerged adult parasites seems preferable to the distribution of host eggs containing parasites ready to emerge, because due consideration can be paid to weather conditions.

TEMPEL (W.). **Ein wenig bekannter Apfelschädling, die Apfelmotte** (*Argyresthia conjugella* **Zell.**). [A little-known Apple Pest, the Apple Moth, *A. conjugella*.]—*Die kranke Pflanze*, iii, no. 8, pp. 149–150, 5 figs. Dresden, August 1926.

It is only in recent times that *Argyresthia conjugella*, Zell., has infested fruit-trees as well as its original food-plant, the service tree [*Sorbus aucuparia*]. It attacks cherry, plum and, more particularly, apple. In Scandinavia nearly half the apple crop was destroyed by it in 1898, 1901, 1905, 1908 and 1910. In England cherries are chiefly affected, and in Canada, plums. In Germany the flight-period has been observed from the end of May to the end of August. The eggs are laid near the calyx of young apples. In autumn the caterpillars leave the fruit and pupate close beneath the surface of the ground. Some cocoons have, however, been found on the bark of the trees or even in the fruit. Infested fruit must be destroyed. Carbolineum painted in winter on the trunks and branches should kill the pupae there, while those in the ground may be destroyed by digging up the soil beneath the tree and stamping it down.

KOVAČEVIĆ (Z.). **Der Ringelspinner und der Schwammspinner und ihre Parasiten.** [*Malacosoma neustria*, L., and *Porthetria dispar*, L., and their Parasites.]—*Anz. Schädlingsk.*, ii, no. 8, pp. 93–94. Berlin, 15th August 1926.

Examinations of *Malacosoma neustria*, L., and *Porthetria dispar*, L., made in 1924 in Jugoslavia resulted in the recording of various parasites.

In addition to the Hymenoptera already noticed [*R.A.E.*, A, xiii, 99], several Tachinids were obtained from the pupae, *viz.*: *Carcelia cheloniae*, Rond., and *Sarcophaga* (*Agria*) *affinis*, Fall., common to both moths; *Blaepharidopsis nemea*, Mg., *Sturmia nidicola*, Towns., and *Phryxe vulgaris*, Fall., from *M. neustria*; and *Lydella nigripes* and *Sarcophaga* sp.? from *P. dispar.*

JANISCH (R.). **Vergleichende Untersuchungen über die Wirksamkeit von Atemgiften auf die Rübenfliege.** [Comparative Researches on the Action of Respiratory Poisons on the Beet Fly.]—*Anz. Schädlingsk.*, ii, no. 8, pp. 94–96. Berlin, 15th August 1926.

Laboratory experiments on the effects of various respiratory poisons on adults of the beet-fly, *Pegomyia hyoscyami*, Panz., are described. Hydrocyanic acid gas proved to be the cheapest and most effective, nicotine coming next. No attempt is made to draw practical conclusions as to the value of such poisons in field work.

FÖLSCH (W.). **Ueber die Mehlmotte,** *Ephestia kuehniella* **Zeller.** [On the Meal Moth, *E. kühniella.*]—*Anz. Schädlingsk.*, ii, no. 8, pp. 98–99, 2 refs. Berlin, 15th August 1926.

After a study of the literature on the meal-moth, *Ephestia kühniella*, Zell., the conclusion is reached that Donysz was right in stating that this Pyralid was a species of wide distribution before it became a pest, and not confined to any given country. Its original food was honey, which was exchanged for flour owing to the peculiarly favourable conditions of warmth offered in mills.

BODENHEIMER [F. S.]. **Ueber Zeit und Ort der ältesten Heu- und Sauerwurmschäden.** [On the Date and Place of the first Injuries by Vine-moths.]—*Anz. Schädlingsk.*, ii, no. 8, pp. 100–103. Berlin, 15th August 1926.

From an examination of the literature the author concludes that there are no grounds at present for assuming the occurrence in Central Europe of injury by vine-moths [*Clysia ambiguella* and *Polychrosis botrana*] prior to the middle of the 18th century. In a note, Dr. Stellwaag refers to records that seem to indicate the presence of these pests as far back as the 15th, 16th and 17th centuries.

NECHLEBA (A.). **Hypertrophische Wucherung der Terminaltriebe an jungen Kiefern infolge des Frasses des Kieferntriebwicklers** (*Graph. buoliana* **Schiff.**). [A hypertrophic Growth on the terminal Shoots of young Pines due to the Feeding of the Pine-shoot Moth, *Rhyacionia buoliana.*]—*Anz. Schädlingsk.*, ii, no. 8, pp. 104–105, 2 figs. Berlin, 15th August 1926.

A deformation of the terminal shoots of pines resembling witch's broom has been considered to be due to repeated feeding by the caterpillars of the pine-shoot moth, *Rhyacionia* (*Grapholitha*) *buoliana*, Schiff. Observations of such a case show this to be due to a single primary feeding by this pest.

VOGEL (R.). **Bemerkungen über das Geschlechtsverhältnis und die Fortpflanzungsbiologie rindenbrütender Borkenkäfer.** [Observations on the Proportion of the Sexes and the Biology of Reproduction in Bark-beetles breeding in the Bark.]—*Forstl. Wochenschr. Silva*, xiii, 1925, pp. 346–348. (Abstract in *Centralbl. Bakt., Paras., Infekt.*, 2te Abt., lxviii, no. 1–7, p. 123. Jena, 20th August 1926.)

In the author's observations the sexes were equally numerous among the young adults of *Pityogenes chalcographus*. It is suggested that the predominance of mature females in the feeding mines as compared with the males is due to the males leaving the mines, whereas the females remain in the same place.

MENZEL (R.). **On the Occurrence of** *Scolytoplatypus hamatus*, **Haged., a new Borer attacking** *Hevea*.—*Meded. Rubberproefst. West-Java*, no. 50, Phytopatholog. Ser. no. 1 ; *Arch. Rubbercult.*, vii, 1923, reprint 5 pp., 2 pls. (Abstract in *Centralbl. Bakt., Paras., Infekt.*, 2te Abt., lxviii, no. 1–7, p. 137. Jena, 20th August 1926.)

The species of *Scolytoplatypus* infesting tea and rubber (*Hevea*) in Java [*R.A.E.*, A, xi, 403] has been identified as *S. hamatus*, Haged. In the observation here described, it entered the healthy bark of 15-year-old *Hevea* about 8–10 ft. above the ground and caused the bark to die. The beetle disappeared after the infested trees had been cut down and burned. Nothing is known of its biology, but attention must be given to its capacity for attacking healthy trees.

STROUHAL (H.). **Pilzfressende Coccinelliden (Tribus Psylloborini.) (Col.).** [Fungus-eating Coccinellids.]—*Zeitschr. wiss. Insektenbiol.*, xxi, no. 6–7, pp. 131–143, 4 figs., 21 refs. Berlin, 30th July 1926.

Notes from the literature and the author's own observations in Austria are given on the following fungus-eating Coccinellids : *Halyzia sedecimguttata*, L., from *Picea canadensis* (*Abies alba*) and ash ; *Vibidia duodecimguttata*, Poda, from peach, hazel and ash ; and *Thea vigintiduopunctata*, L., from hops, oak, dogwood (*Cornus sanguinea*) and peas. Though fungi injurious to the plants are the sole food of these beetles, their beneficial effect is negligible, as the adults only oviposit on plants that are already infected and provide food for the larvae. There is, moreover, a risk of indirect harm, as the beetles may help to spread the fungi mechanically.

WASMANN (E.). **Versuche über den Farbensinn des Rapskäfers** (*Meligethes aeneus* **L.**). [Experiments on the Colour Sense of the Rape Beetle, *M. aeneus*.]—*Zeitschr. wiss. Insektenbiol.*, xxi, no. 6–7, p. 147. Berlin, 30th July 1926.

This is the record of an observation on the effect of colour on the rape-beetle, *Meligethes aeneus*, L. Four trays of different colours attracted the beetles in varying numbers, counts being made at intervals of five minutes. The numbers taken were : on ochre yellow, 3–5 ; on sap-green, 0–2 ; on rape yellow, 30–40 ; and on silver white, 0–2. *M. aeneus* thus possesses a marked sense of colour and prefers the colour of the flowers of its normal food-plant (rape).

STELLWAAG (F.). **Methoden der biologischen Bekämpfung schädlicher Insekten im Pflanzenschutz.** [The Methods for the biological Control of Insect Pests in Plant Protection Work.]—*in* ABDERHALDEN: *Handbuch der biol. Arbeitsmethoden*, Abt. ix, Teil 1, pp. 603–660, 5 figs. Berlin [1926].

This paper describes the methods to be followed and the conditions necessary for the biological control of injurious insects. A knowledge of all the various factors involved is a necessary preliminary to such work, and failures that have occurred in the past are due to the lack of such a basis.

MÜLLER (A.). **Die innere Therapie der Pflanzen.** [The internal Treatment of Plants.]—*Monogr. angew. Ent.*, no. 8 (Supplement to *Zeitschr. angew. Ent.*, xii), vi+206 pp., 29 figs., 213 refs. Berlin, 1926.

A brief lecture on the experiments dealt with in this monograph on the internal treatment of plants has already been noticed [*R.A.E.*, A, xiii, 62]. A detailed survey of work already published is given as an introduction to the author's own investigations, which are described at length, particulars being also given of the methods and apparatus used. Laboratory experiments with Aphids using a great number of chemicals were made on the lines described in the lecture.

Both pyridin and aluminium sulphate caused the woolly apple aphis, *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., to leave the treated twigs; the Aphids were not killed. The concentrations that proved harmless to the plants and those that were injurious are given. *Aphis rumicis*, L. (*fabae*, Scop.), migrated from beans standing in a 1 per cent. solution of pyridin; *A. pomi*, DeG., migrated from apple twigs standing in solutions of 4 per mille—1 per mille.

In the field, apple trees and bushes infested with *E. lanigerum* were treated by boring holes in such positions as should ensure the injected chemical being borne in the sap-flow to the infested places. After injection the hole was closed with a cork and covered with wax. Injections of 5 per cent. pyridin cleared a plant of *E. lanigerum*. Experiments were also made with plant juices, and it was found that a mixture of equal parts of rhubarb sap, tobacco sap, tomato sap and an aqueous extract of tobacco, plus 1 per cent of boric acid, had some effect on the infestation.

Internal treatment may take an important place among the usual chemical control methods; it might permit of preventive and curative measures against pests not amenable to treatment by external insecticides, and of the treatment of plants that are difficult to treat in any other way.

SACHTLEBEN (H.). **Versuche zur Maikäferbekämpfung mit arsenhaltigen Stäubemitteln.** [Experiments with arsenical Dusts against May Beetles.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xv, no. 1, pp. 19–46, 1 map, 3 pls., 5 refs. Berlin, September 1926.

A detailed account is given of experiments in dusting large numbers of deciduous trees with calcium arsenate in an attempt to destroy the swarms of May beetles [*Melolontha melolontha*] and thus avert the injury done by their larvae. The treatment proved of no value against these pests, and collection had to be resorted to. It was, however, effective against the larvae of sawflies and Lepidoptera. For instance, on the 16th and 18th May nearly all the caterpillars of *Anisopteryx aescularia*, Schiff., on birch and oak trees dusted on 14th May were found to be dead. The motor duster used proved more independent of wind conditions than an aeroplane, as it enables the areas dusted to be better limited and facilitates the regulation of the density of the dust cloud. Under favourable conditions of wind and situation of forest roads, the dusting of even large areas can be completed much more quickly than hitherto thought possible.

Scheidter's statements on the time taken for the eggs of *M. melolontha* to mature [*R.A.E.*, A, xiv, 314] were borne out by the author's observations; they differ from those recorded by Jegen [A, xiii, 149]. There is, therefore, a period of about 14 days, counting from the appearance of the first adults, in which to apply measures aiming at destroying them prior to oviposition. Rooks feed eagerly on the beetles.

Jahresheft 1924 des Phänologischen Reichsdienstes. [Report for 1924 of the Imperial Phenological Service.]—*Mitt. biol. Reichsanst. Land- u. Forstw.*, no. 28, 338 pp., 3 maps. Berlin, July 1926.

This report is compiled in the same manner as the preceding ones [*R.A.E.*, A, xiii, 165; xiv, 314].

Zacher [F.]. **Schädlinge im Guatemala-Mais.** [Pests in Maize from Guatemala.]—*Mitt. Ges. Vorratsschutz*, ii, no. 5, pp. 45–47, 1 fig. Berlin, September 1926.

A maize sample sent to Germany from Guatemala contained *Calandra zea-mais*, Motsch., which was found to breed readily at room temperature. The Cryptophagid, *Pharaxonota kirschi*, Reitt., was present in considerable numbers. The beetles and larvae appear to feed on grain débris, and can breed in flour; they are attacked by a mite, *Pediculoides ventricosus*, Newp. A Cucujid, *Cathartus cassiae*, Reiche, occurred in still larger numbers than the preceding species; its normal food is the fruits of *Cassia fistula*. It bred readily at room temperature. Other beetles found in the sample were the Mycetophagid, *Litargus balteatus*, Lec., a species of little practical importance, and one specimen of the Bostrychid, *Dinoderus truncatus*, Horn.

Roepke (W.). **Vorratsschädlinge auf Java.** [Pests of Stored Products in Java.]—*Mitt. Ges. Vorratsschutz*, ii, no. 5, pp. 50–53. Berlin, September 1926.

This is a brief survey of insect pests found in Java in stored products, especially during and following the war, at which period enormous stocks accumulated. The more important Coleoptera include *Tribolium* spp., and *Silvanus* (*Oryzaephilus*) *surinamensis*, occurring in imported cereals, rice, ground-nuts and oil-cake; *Laemophloeus* sp., *Lophocateres pusillus*, etc., attacking stored, unshelled rice, but doing little harm; *Calandra oryzae*, infesting imported cereals, maize and husked rice, and bad qualities of unshelled rice, and causing severe losses; *Sitodrepa panicea*; *Lasioderma serricorne*, which did much injury to tobacco during the war; *Araecerus fasciculatus*, occurring almost exclusively in dried beans of *Coffea arabica* and *C. liberica*, good qualities of *C. robusta* being practically untouched; and *Bruchus* (*Pachymerus*) *chinensis*, infesting pulses. The flour beetle, *Tenebrio molitor*, was not observed, its place being taken in Java by *Tenebroides mauretanicus*, the importance of which is, however, uncertain. The predacious Clerid, *Necrobia rufipes*, sometimes occurs in numbers in copra. *Dermestes* spp. occur in bacon, hides, etc.

Lepidopterous pests include the Pyralids, *Corcyra cephalonica*, in meal, and *Tagora figurana*, in husked rice and maize. *Sitotroga cerealella* infests rice from harvest time onwards.

Another pest is the cockroach, *Periplaneta americana*, which in the interior is replaced by *P. australasiae*. Neither *Blatta* (*P.*) *orientalis* nor *Blattella* (*Phyllodromia*) *germanica* was seen, though the latter is said to occur in Java. Psocids and *Lepisma* spp. occur everywhere.

FLEISCHER (A.). **Der grösste Bohnenschädling** (*Acanthoscelides obtectus*, **Say**=*irresectus*, **Fahr.**). [The chief Pest of Beans (*Bruchus obtectus*).]—*Mitt. Ges. Vorratsschutz*, ii, no. 5, p. 55. Berlin, September 1926.

Bruchus (*Acanthoscelides*) *obtectus*, Say, was originally described from Persia, and has spread thence, chiefly to America. In 1925 it was introduced from Brazil into Vienna and caused enormous losses in bean warehouses there. It is now established in Austria, and all damaged beans should be sent for expert investigation.

[ZNAMENSKIĬ (A. V.).] **Знаменский (А. В.). Insects injurious to Agriculture. Part I. Pests of Grain Crops.** [*In Russian.*]—Trud. Poltavsk. S.-Kh. Opuitn. Stantz. [*Trans. Poltava Agric. Expt. Sta.*], no. 50, Ent. Div. xiii, 296 pp., 7 pls., 118 figs. Poltava, July 1926.

Though this book was originally intended as a revision of a similar one by Kurdyumov [*R.A.E.*, A, ii, 170], now out of print, it has been mainly based on personal observations and general information collected at the Poltava station during 15 years, and to some extent on the Russian and foreign literature that has appeared since 1913.

The first three chapters are of a general character giving an outline of the damage caused by insects, the various factors influencing their abundance, instructions for field observations and collection of specimens, and a discussion of the different forms of control measures.

In the remaining chapters, the insects are dealt with individually according to orders, with, in most cases, a description of the stages, and a discussion of the bionomics and control. In compiling the information concerning some of the more important pests, such as locusts and Aphids, the author has obtained the assistance of specialists in the groups concerned.

Numerous keys are a feature of the work. Indices are given to the scientific and Russian names of the pests dealt with.

[PLOTNIKOV (V. I.).] **Плотников (В. И.). Insects injurious to Cotton in Turkestan.** [*In Russian.*]—Khlopkovoe Delo [*Cotton Indust.*], v, no. 1–2, pp. 80–93, 13 refs. Moscow, January–February 1926. [Recd. September 1926.]

The previous literature on the insect pests of cotton in Turkestan is reviewed [*R.A.E.*, A, ii, 311 ; iv, 210, 215 ; xii, 555]. Among those that have apparently not been previously recorded as injuring cotton are *Polyphylla adspersa*, Motsch., *Colaphus hoefti*, Fald., *Heliothis scutosa*, Schiff., and *Melanotus conicicollis*, Rtt.

The most serious pests are: *Tetranychus telarius*, L., *Aphis gossypii*, Glov., *Thrips flavus*, Schr., and *Euxoa* (*Agrotis*) *segetum*, Schiff., which were studied during 1925, brief notes being given on their bionomics.

[EVSTROPOV (I. I.).] **Евстропов (И. И.). Cotton Pests in the Nakhichevan Region and their Control in 1925.** [*In Russian.*]—Khlopkovoe Delo [*Cotton Indust.*], v, no. 6–8, pp. 488–493, 2 refs. Moscow, June–August 1926.

Climatic and other conditions are particularly favourable for the development of the cotton mite, *Tetranychus* sp. (the author considers that there are differences between this species and *T. telarius*, L.) in the cotton fields of Nakhichevan. Sulphur dusts, which were applied on a large scale in 1925, did not prove satisfactory. The dusted plants droop and only revive if liberally watered, which cannot be done in districts where the water is scarce; moreover, though the adult mites are killed, the eggs are unaffected [*cf. R.A.E.*, A, xiv, 107], and re-infestation also occurs as a result of migration from other food-plants in the vicinity.

Thrips flavus, Schr., when occurring in company with *Tetranychus* sp., was apparently destroyed by the sulphur dust, but no comparative tests could be made. Soap emulsions were tried to some extent against *Aphis gossypii*, Glov., but with the timely destruction of weeds the injury to cotton is greatly reduced. Larvae of *Laphygma* (*Caradrina*) *exigua*, Hb., presumably of the second generation, which occurred on lucerne in August, subsequently migrated to cotton. *Heliothis obsoleta*, F. (*armigera*, Hb.) was not observed during 1925.

[LEZHAVA (V. V.).] **Лежава (В. В.).** *Gryllus desertus*, **Pall., as a Pest of Cotton.** [*In Russian.*]—Khlopkovoe Delo [*Cotton Indust.*], v, no. 6–8, pp. 494–495. Moscow, June–August 1926.

Damage to cotton of an unusual type, noticed on the experimental farm in Turkestan in 1925, was found to be due to *Gryllus desertus*, Pall. In all cases the cotyledons and leaves had been eaten into.

[UVAROV (B. P.).] **Уваров (Б. П.). The Question of controlling " Chor " of Cotton.** [*In Russian.*]—Khlopkovoe Delo [*Cotton Indust.*], v, no. 6–8, pp. 495–501, 8 refs. Moscow, June–August 1926.

The condition of cotton known in Armenia as " chor " is presumably chiefly due to the activities of *Tetranychus*. Experiments with sulphur dust for the destruction of the mites have not apparently been very successful [*cf. R.A.E.*, A, xiv, 107].

Recent work on the destruction of *Tetranychus* in various parts of the world is reviewed, and it is suggested that improved cultural methods and general strengthening of the plants might greatly reduce infestation. Although this mite is apparently the principal cause of " chor," the relation between this condition and bacterial and functional diseases requires investigation.

[Zaïtzev (F. A.).] **Зайцев (Ф. А.). Citrus Pests on the Batoum Coast.** [*In Russian.*]—*Bull. Polytech. Inst. Tiflis*, i, pp. 273–276, 4 refs. Tiflis, 1924. [Recd. July 1926.]

An annotated list is given of the Coccids occurring on *Citrus* on the Batoum coast, comprising *Lepidosaphes gloveri*, Pack., *L. pinnaeformis*, Bch., *Parlatoria zizyphus*, Luc., *Chrysomphalus aurantii*, Mask., *C. dictyospermi*, Morg., *Pseudococcus citri*, Risso, *Pulvinaria floccifera*, Westw., *Coccus* (*Lecanium*) *hesperidum*, L., *Saissetia* (*L.*) *oleae*, Bern., and *Ceroplastes cirripediformis*, Comst.

Other insects injurious to *Citrus* in the district are *Toxoptera aurantii*, Boy., *Poecilimon flavescens*, H.-S. (?) and *Otiorrhynchus tiflensis*, Reitt.

Mosely (M. E.). **Insect Life and the Management of a Trout Fishery.**—Fscap. 8vo, xi+112 pp., 18 pls., 1 folding plan, 2 figs. London, Routledge & Sons, Ltd., 1926. Price 7*s.* 6*d.*

The object of this book is to enable those interested in the care of trout fisheries to determine the methods by which the insects that are the food of the trout may best be protected and encouraged, and in some cases introduced. The first part contains chapters on the life-history of Trichoptera (caddis-flies), Ephemeroptera (May-flies), Plecoptera (stone-flies) and *Sialis lutaria* (alder-fly), their identification, and the types of water that they inhabit, these groups including all the insects important as food for trout. In the second part the management of trout streams is discussed, including the introduction of insects into new waters or waters where they have become rare, and the treatment of weeds and mud, the regulation of which is of importance both to insects and trout.

Miles (H. W.). **Glasshouse Fumigation with Calcium Cyanide.**—*Fruit, Flower & Veg. Trades Jl.*, reprint, 3 pp., 4 figs. London, 10th July 1926.

The method of using calcium cyanide for fumigating glasshouses is described. The quantity that can be safely used varies with different plants, but in most cases ¼ oz. per 1,000 cu. ft. does not injure the plants if the fumigation is carried out under the right conditions, and generally gives a satisfactory control over insect pests. Certain plants, such as *Asparagus plumosus*, should not be subjected to a higher dosage than ⅛ oz. per 1,000 cu. ft., while others, such as carnations, are not injured by ⅔ oz. These amounts have been used in fumigations carried out in Britain, and a list of other plants fumigated and the dosages employed is given.

Trialeurodes (*Aleurodes*) *vaporariorum*, Westw., on tomatos can be controlled by dosages of ¼ to ⅓ oz., the smaller quantity giving adequate control if fumigations are repeated at intervals of about 10 days; even with the larger amount, which kills both the adult and immature stages, periodical fumigation may be necessary owing to re-infestation of a greenhouse from outside. *Myzus persicae*, Sulz., on tomatos, carnations, *Freesia*, etc., *Myzus circumflexus*, Buckt., injuring the flower buds of arums [*Richardia*], *Macrosiphum rosae*, L., on rose, and *M. solanifolii*, Ashm., on tulips, are usually controlled by ¼ oz. per 1,000 cu. ft. *M.* (*Macrosiphoniella*) *sanborni*, Gill., is more resistant and usually requires ⅓ oz. per 1,000 cu. ft.; it is a common pest of chrysanthemums and occurs also on other plants. *Thrips tabaci*, Lind., on carnations, *Heliothrips bicinctus*, Bagn., on smilax [*Asparagus medeoloides*], and *H. haemorrhoidalis*, Bch., on arum, may be controlled to some extent by ⅓ oz. per 1,000 cu. ft., but under fairly dry conditions it is advisable to use ⅔ oz.

Some evidence was obtained that the larvae of *Phytomyza nigricornis*, Mg. (chrysanthemum leaf-miner) were affected by fumigation with calcium cyanide, but the best method of controlling this pest is by fumigating at intervals of 5 to 8 days after the plants have been placed in a glasshouse for flowering, when the flies are emerging. A springtail, *Tomocerus longicornis*, Müll., is sometimes very abundant in propagating houses, where it may cause severe damage to young seedlings ; it can usually be satisfactorily controlled by scattering calcium cyanide freely about the house, behind hot water pipes and under staging, before the seed pans are brought in.

Collected Leaflets on Insect Pests of Fruit Trees.—*Minist. Agric. & Fisheries*, Sectional Vol. ii, 4th edn., 102 pp., pls., figs., refs. London, 1926. Price 10*d*. net.

In this revised edition of a volume previously noticed [*R.A.E.*, A, xiii, 6], various slight alterations have been made, and several new plates have been introduced.

Destructive Insect and Pest, England. The Importation of Raw Cherries Order of 1926.—*Statutory Rules & Orders*, 1926, no. 712, 3 pp. London, 11th June 1926.

To prevent the introduction of *Rhagoletis cerasi* (cherry fruit-fly), no raw cherries may be introduced into England or Wales from any port in France, without a certificate as to country of origin, or, in the case of cherries grown in France, of freedom of the Department in which they were grown from the cherry fruit-fly.

Gibson (G. W.). **The Control of the Narcissus Eelworm.**—*Jl. Minist. Agric.*, xxxiii, no. 6, pp. 531–544, 2 pls. London, September 1926.

The narcissus race of *Tylenchus dipsaci*, Kühn (stem eelworm) has spread very rapidly in recent years, and growers who obtain bulbs from various parts of the country as well as from abroad continually run the risk of introducing it to their farms. The conditions that influence its spread in the field are little understood, but there is some evidence to show that it is favoured by a high water-content in the soil. In glasshouses the decay of attacked bulbs is often very rapid owing to the invasion of the injured tissue by fungi and bacteria, and as the Nematodes are very sensitive to changes in the cell sap they have either to leave the damaged bulbs or die. No efficient method of killing Nematodes in the soil that is practicable on a large scale has yet been discovered, but the narcissus race can be starved out of land from which all bulbs are removed for a period of years [*cf.* *R.A.E.*, A, xiv, 398]. It is suggested that all new bulbs acquired by a grower should be treated in hot water or, if it is not desired to do this, that they should be planted in a place apart from the main bulb fields where they can be observed.

In order to make known the value of the hot water treatment for the control of the narcissus eelworm, a description is given of the apparatus and methods in use at the Isles of Scilly Experimental Station, and details of the subsequent development of a large number of samples of treated bulbs are tabulated. The bulbs are placed in wire-mesh trays, which are immersed in water in a tank heated from below by steam passed through coils; the temperature is registered by several thermometers in various positions in the tanks, and is regulated by regulating the steam; the internal temperature of the bulbs is also registered. It is necessary for a temperature of 110° F. to be maintained for three hours, even when treating small narcissus bulbs, and temperatures slightly in excess of this do no harm if of short duration, as they do not reach the growing points of the bulbs; Nematodes were not completely controlled in some rather small bulbs immersed in water at 110° F. for only 2½ hours. It was found that the method of drying the bulbs after treatment affected their subsequent growth; those that were dried slowly indoors were not damaged, but the flower buds of others that were placed in the fields while still warm were in many cases destroyed. Bulbs that have been thoroughly ripened prior to treatment are far less liable to injury than those that have not, and they are not injured by a temperature of 110° F. even if maintained for some hours.

The hot water treatment also destroys the bulb mite [*Rhizoglyphus echinopus*, F. & R.] and the larvae of the narcissus flies [*Eumerus strigatus*, F., and *Merodon equestris*, F.].

MURPHY (P. A.) & MCKAY (R.). **Investigations on the Leaf-roll and Mosaic Diseases of the Potato.**—[*Ireland*:] *Dept. Lands & Agric. Jl.*, xxvi, no. 1, pp. 1–8, 2 pls., 5 refs. Dublin, 1926.

This paper forms a continuation of a series of which previous ones have been noticed [*R.A.E.*, A, xi, 92, etc.]. After describing the technique recently adopted in investigating the potato virus diseases and some of the results obtained by these methods, which subjects have been more fully dealt with elsewhere [*R.A.E.*, A, xiv, 113], the authors discuss the problem of the production of healthy seed potatoes. Seed that has been proved healthy can be propagated without danger of becoming diseased if planted in plots that have not borne potatoes for some years and are surrounded by wheat and 200 yards from the nearest potato fields; the plots should be dug by 15th July.

IMMS (A. D.). **The Biological Control of Insect Pests and Injurious Plants in the Hawaiian Islands.**—*Ann. App. Biol.*, xiii, no. 3, pp. 402–423, 1 pl., 26 refs. Cambridge, August 1926.

In this account of the introduction and breeding of parasites of injurious insects and insects that control injurious plants in the Hawaiian Islands from 1890 to the present time, the biological control of each of the most important pests is discussed [*cf.* *R.A.E.*, A, iii, 757; xii, 114; xiv, 335]. The author briefly describes some of the peculiarities of the Hawaiian insect fauna and the climatic conditions that make it particularly suited to the introduction of parasites; the position of the islands with regard to trade routes has facilitated the introduction of foreign insects, and all the most serious pests are introduced species. The uniform temperature throughout the year makes it possible for both parasites and hosts to develop continuously.

Tattersfield (F.), Gimingham (C. T.) & Morris (H. M.). **Studies on Contact Insecticides. Part IV. A Quantitative Examination of the Toxicity of Certain Plants and Plant Products to** *Aphis rumicis*, **L. (the Bean Aphis).**—*Ann. App. Biol.*, xiii, no. 3, pp. 424–445, 6 diagr., 22 refs. Cambridge, August 1926.

Previous papers of this series and the technique employed have been noticed [*R.A.E.*, A, xii, 225; xiii, 158, 362]. Two plants known as black and white haiari are extensively used by the natives of British Guiana as fish-poisons, the stems of the former and the roots of the latter being employed; they are climbing Leguminous plants, probably *Lonchocarpus* spp. The roots, stems and leaves of both species, prepared as alcoholic extracts, were tested as contact insecticides on *Aphis rumicis*, L.; 10 gm. of finely divided material were soaked over night in absolute alcohol and filtered, the filtrate being made up to 100 cc. with absolute alcohol; the alcoholic extract was diluted as required with 1 per cent. saponin solution. At concentrations equivalent to 0·5 per cent. of the plant and over, the roots and stems of both species gave 100 per cent. mortality; the most toxic extract was that prepared from the root of white haiari, and the least, that from the stems of the same plant, but the differences were slight, and probably of little importance, and all four extracts were more toxic than a similar extract of *Derris elliptica*. The leaves were not toxic at any concentration tested. In field tests with alcoholic extracts at a concentration equivalent to 1 per cent. of root and stem with 0·25 per cent. soft soap, *A. rumicis* on beans was almost completely controlled. From alcoholic extracts of haiari, crystals were obtained, that proved to be identical with tubatoxin, the principal insecticidal constituent of *Derris elliptica* [*R.A.E.*, A, xi, 250], and it is evident that it is also the main insecticidal constituent of haiari, although resins obtained were somewhat toxic. In the laboratory tubatoxin was considerably more toxic than nicotine, but as it is non-volatile, a direct hit is probably necessary, and it is likely that the difference would be less marked in field tests. Tests with alcoholic extracts of haiari as stomach poisons for the larvae of *Selenia tetralunaria*, Hufn., and *Abraxas grossulariata*, L., showed that they had some toxicity for the former, but very slight toxicity for the latter; sprayed leaves were strongly repellent to both species.

Further investigations of *Tephrosia vogeli* confirmed the results previously obtained concerning the relative toxicity of the leaves and seeds and the stems [*R.A.E.*, A, xiii, 159]; neither the stems nor the roots possess high toxic properties. Samples of *T. toxicaria* from British Guiana and of the roots and stems of *T. candida* from the West Indies were also tested; the roots of *T. toxicaria* are as toxic as the leaves of *T. vogeli*, while the stems are less toxic than those of the latter and the leaves possess only slight insecticidal properties; neither the roots nor the stems of *T. candida* were more than moderately toxic, although somewhat more so than the stems of *T. toxicaria*. The extracts of *Tephrosia* were prepared in the same way as those of haiari. From *T. vogeli* several derivatives were isolated, the most important being a highly toxic resin and two colourless crystals melting at 191–193° C. [375·8–379·4° F.] and 201·5° C. [394·7° F.] respectively. Indefinite results were obtained with the crystals, but they did not appear to be highly toxic to *A. rumicis*, though this may have been due to their relative insolubility in organic solvents. Although it is unlikely that the crystalline substances are the chief toxic constituents of the plant, the experiments carried out were not sufficient to decide whether the toxicity is mainly due to the resin. Owing to the treatment employed in their isolation it is doubtful whether either of the crystals or Hanriot's tephrosin [*loc. cit.*], which apparently differs from them, is present as such in the plant. A preliminary attempt was also made to separate the toxic constituents in the roots of *T. toxicaria*, using the basic lead acetate method. A resinous material isolated proved highly toxic to *A. rumicis*, but the only other product obtained in sufficient quantity to test, a compound crystallising in yellow needles melting at 213–214° C. [415·4–417·2° F.], showed no toxic properties at the concentrations tried. Alcoholic extracts of the leaves of *T. vogeli* and the roots of *T. toxicaria* tested as stomach poisons gave similar results to white and black haiari.

As all the tropical plants tested for insecticidal properties by the authors belonged to the Leguminosae, it was thought of interest to test certain plants of that order that grow in Britain. The leaves, stems and roots of three species of lupin (*Lupinus*) tested did not possess any marked insecticidal action, but alcoholic extracts of the seeds of two species were toxic. Cytisine is an alkaloid occurring in species of *Cytisus*, *Genista*, *Ulex*, *Sophora* and *Baptisia* that has a physiological action very closely resembling that of nicotine. Crude and pure cytisine and extracts of seeds of broom (*Cytisus scoparius*), laburnum (*C. laburnum*), gorse (*Ulex europaeus*) and *Sophora tomentosa* were tested on *A. rumicis*; crude and pure cytisine had considerable insecticidal value, but were less toxic than nicotine; the extracts, except that of *S. tomentosa*, were toxic, but not sufficiently so for it to appear probable that they may prove of practical importance. Cytisine was not toxic to the eggs or, as a stomach poison, to the larvae of *S. tetralunaria*.

Lobeline, an alkaloid that occurs in *Lobelia inflata* and resembles nicotine in its physiological effects, in its pure form, had a toxicity about equal to that of crude cytisine, while extracts proved only slightly toxic; its sternutative properties detract from its possible practical value.

Mammea americana, from the West Indies, and *Asclepias curassavica*, from British Guiana, did not warrant more than preliminary investigation. Alcoholic extracts of tomato (leaves and stems), camomile, feverfew [*Chrysanthemum parthenium*], and tansy [*Tanacetum vulgare*] showed no significant toxicity against *A. rumicis*, and similar results were obtained with commercially prepared extracts of belladonna [*Atropa belladonna*], hellebore, hemp (*Cannabis indica*), stramonium [*Datura stramonium*], colocynth [*Citrullus colocynthis*], *Hyoscyamus* and *Digitalis*.

Among miscellaneous alkaloids tested on *A. rumicis*, only eserine (physostigmine), from Calabar beans [*Physostigma venenosum*], approached nicotine in toxicity; arecoline, from *Areca* (betel nut), sparteine, from broom (*Cytisus scoparius*), coniine, from *Conium maculatum*, pelletierine and pseudopelletierine were toxic at concentrations of between 1·0 and 0·5 per cent.; hydrastine, hydrastinine and narcotine were not materially toxic at these concentrations.

In the few cases in which the authors carried out field trials as well as laboratory tests, the latter were mainly in agreement with the former, but in some cases irregularities were observed, and many more experiments are necessary, including studies of the best methods of preparing extracts and securing efficient spreading, wetting and adherence. *Tephrosia vogeli* and probably *T. toxicaria* could be obtained in large quantities comparatively easily, but whether this is the case with the haiaris is not known at present. If the various difficulties can be overcome, these plants, on account of their high toxicity to Aphids and harmlessness to foliage, have great possibilities as contact insecticides.

GIMINGHAM (C. T.), MASSEE (A. M.) & TATTERSFIELD (F.). **A Quantitative Examination of the Toxicity of 3 : 5-dinitro-o-cresol and other Compounds to Insect Eggs, under Laboratory and Field Conditions.** —*Ann. App. Biol.*, xiii, no. 3, pp. 446–465, 1 pl., 3 diagr., 3 refs. Cambridge, August 1926.

As the result of laboratory experiments it was found that 3 : 5-dinitro-ortho-cresol (1-methyl-2-oxy-3 : 5-dinitrobenzene), referred to in this paper as dinitro-cresol, and its salts were highly toxic to Aphids and Lepidopterous eggs [*R.A.E.*, A, xiii, 364]. The experiments with the eggs of *Selenia tetralunaria*, Hufn., were repeated on a larger scale ; 0·15 gm. dinitro-cresol per 100 cc. and an amount of sodium dinitro-ortho-cresylate equivalent to 0·35 gm. dinitro-cresol per 100 cc. both killed 100 per cent. of the eggs, as did also a proprietary coal-tar distillate at 7·5 per cent. A batch of eggs of *Cheimatobia brumata*, L., was sprayed with dinitro-cresol at 0·25 per cent. with the result that only 5·4 per cent. hatched, while of a control batch 98 per cent. hatched ; the eggs of *C. brumata* are known to be highly resistant to insecticides. Dinitro-cresol was also highly toxic to eggs of *Polia* (*Hadena*) *oleracea*, L., *Abraxas grossulariata*, L., *Notolophus* (*Orgyia*) *antiquus*, L., and *Tortrix pronubana*, Hb., in small experiments. Evidence was obtained that the toxic effect of dinitro-cresol on the eggs *S. tetralunaria* is not diminished if they are washed in a stream of water a few hours after application. The difference in toxicity between dinitro-cresol and its sodium salt is very small, although probably significant.

Field tests of dinitro-cresol and sodium dinitro-ortho-cresylate were made in an orchard of young plum trees in which there was an even and heavy infestation of eggs of *Phorodon humuli*, Schr., and *Tetranychus telarius*, L. In the past, the effect of winter washes in destroying eggs has generally been judged from the appearance of the trees in leaf, but this method does not provide data on the percentage of eggs destroyed by a spray ; a new method was therefore adopted. The eggs of *P. humuli* on a large number of marked twigs were counted and their positions recorded before spraying. After the spraying had been done, twigs were examined daily for hatching eggs, and it was found that when 55 per cent. of the eggs had hatched on the control trees the remainder had almost all shrivelled ; the twigs on the sprayed trees on which the eggs had been counted were then cut and examined in the laboratory to determine the numbers of hatched and shrivelled eggs among those that had been recorded ; only 6 per cent. of the eggs originally counted could not be found in the second count. A detailed examination of shoots from control trees showed that 45 per cent. of the eggs of *P. humuli* failed to hatch from natural causes.

For the purposes of comparison three plots were sprayed with chlordinitrobenzene, an emulsified heavy oil and a coal-tar distillate, respectively. Stock solutions of dinitro-cresol were prepared in a high flash tar oil and in an emulsified tar distillate disinfectant ; solutions in the former solvent were diluted for use with a 0·5 per cent. soap solution in order to obtain a stable emulsion, with the result that double decomposition of the soap took place, producing some sodium dinitro-cresylate and fatty acids, but the proportion of dinitro-cresol was not thereby altered ; the stock solution made with the emulsified disinfectant could be diluted with water alone. The stock solution of sodium dinitro-ortho-cresylate was prepared by stirring dinitro-cresol with a solution of sodium carbonate at a strength slightly in excess of that required for neutralisation ; this stock solution was diluted for use with 0·5 per cent. soft soap in water. Chlordinitrobenzene was dissolved in high flash tar oil, and the stock solution was diluted with soap solution ; the emulsified heavy oil and the coal tar distillate were diluted with water only. The sprays were applied at a pressure of 75–80 lb. per square inch on 22nd December.

In comparing the results obtained with the different sprays the percentage of viable eggs killed was calculated by subtracting the percentage that did not hatch on the control plots (45) from the percentage that did not hatch on the sprayed plots and expressing the result as a percentage of the viable eggs on the control plots (55). Dinitro-cresol at concentrations ranging from 0·5 per cent. to 0·15 per cent. killed 80–82 per cent. of the viable eggs of *P. humuli* ; the solvents alone were not toxic at the lower strengths used and only somewhat so at the highest. Sodium dinitro-ortho-cresylate at a concentration of 0·35 per cent. (calculated as dinitro-cresol) also killed 80 per cent. of the viable eggs, and was thus little less effective than dinitro-cresol ; the sodium salt has the advantage that it is soluble in water to the extent of about 5 per cent. and can be used with soap solution without liberating free fatty acids; on the other hand preliminary laboratory experiments indicated that it is more readily removed by water after it has dried than dinitro-cresol. The proprietary coal-tar distillate at 7·5 per cent. killed 77 per cent. of the viable eggs ; the emulsified heavy oil at the same strength did not kill any ; chlordinitrobenzene at 2·5 per cent. killed 56 per cent.

It is probable that a kill of 80 per cent. of the viable eggs represents a kill of 100 per cent. of those that actually came into contact with the fluid ; the freedom of the sprayed trees from Aphids in the spring following spraying indicated, however, that it was very unlikely that the larvae from the 20 per cent. of viable eggs recorded as having hatched actually survived to complete their development ; most of them were probably killed immediately on emergence by contact with or absorption of traces of the poison. The plum trees on the plots sprayed with dinitro-cresol and sodium dinitro-ortho-cresylate remained almost free from Aphids throughout the summer, the slight infestations that did occur on them being probably due to migration from the adjoining plots, which were heavily infested. The sprays had a marked general cleansing effect on the trees and did not apparently injure them in any way. *T. telarius* was not controlled by any of the sprays used, but *Eriophyes phloeocoptes*, Nal., a gall mite that hibernates beneath the bud scales, was probably destroyed, as it was found on the control plots only.

Discussion on "The Place of the Systematist in Applied Biological Work."—*Ann. App. Biol.*, xiii, no. 3, pp. 466–485. Cambridge, August 1926.

Dr. J. Waterston, in opening the discussion, spoke of the nature of the work of the present day systematist, and pointed out that, although it is of great importance to the applied biologist, there has not been an increase in the number of systematists commensurate with the increase in the number of applied biologists in recent years. A knowledge of the identity and relationships of an organism that he is studying is essential to the applied biologist, and this he cannot obtain without the aid of the systematist. The value of correct nomenclature, for changes in which the systematist is frequently blamed, to the worker in applied biology is that without it, published work on an organism under a name older than the one by which it is known to him may be entirely overlooked.

Dr. A. D. Imms endorsed Dr. Waterston's views and gave instances illustrating the importance of the correct specific identification of insects ; he also drew attention to the need for the systematic study and description of the larval forms of insects, and for the quantitative study of the range of variation of the characters used for descriptive purposes.

Dr. W. B. Brierley considered that the more successful the systematist was the less necessary did he become, as his diagnoses and keys could be used by other workers ; he thought that the importance of systematics to applied biology had been somewhat over-emphasised. Mr. R. Stenton also thought that if systematists completely succeeded in their object it would be possible for applied biologists to identify species from published keys. Referring to the question of synonymy, he drew attention to the difficult position of those responsible for publishing biological information for the use of farmers and horticulturists when well-known names are changed by systematists.

Mr. J. C. F. Fryer emphasised the importance of training in the principles of taxonomy as part of the equipment of the economic biologist, who may often be working in regions where the assistance of a systematist is not available ; moreover an economic biologist may have opportunities of confirming or disproving by biological studies the conclusions drawn by systematists from the study of morphological characters, and he considered that much would be gained by spreading the study of systematics over the whole field of biology.

FAURE (Jean C.). **Contribution à l'étude d'un complexe biologique : la Piéride du chou** (*Pieris brassicae*, **L.**) **et ses parasites hyménoptères.**—8vo, 222 pp., 7 pls., 11 pp. refs. Lyon, Faculté des Sciences de l'Université, 1926.

The author has made an exhaustive study of *Pieris brassicae*, L. (cabbage butterfly), and gives a full general account of the insect, particularly as occurring in the neighbourhood of Lyons, where the study was made. This region lies between the northern zone, where there are two markedly distinct generations in a year, and the southern zone, where there are at least three generations and where the insect is found in its different stages throughout the year. Details are also given of the biology of the numerous Hymenopterous parasites associated with *P. brassicae*, of which only a small number are considered of any importance in its control. The primary parasites dealt with are *Trichogramma evanescens*, Westw., parasitic on the eggs ; *Apanteles glomeratus*, L., *A. rubripes*, Halid., *Anilastus ebeninus*, Grav., and *A. vulgaris*, Brischke, parasites of the larvae ; and *Pteromalus puparum*, L., *Chalcis femorata*, Panz., and *Pimpla instigator*, F., parasitic on the pupae. The great majority of the hyperparasites discussed were taken from *Apanteles glomeratus* [*cf. R.A.E.*, A, xiii, 460, etc.].

Descriptions, supplementary to the original ones, are given of *Spilocryptus ferrieri* [*R.A.E.*, A, xiv, 307] and of *Schizonotus pailloti* and *Homoporus luniger* var. *braconidis* [*R.A.E.*, A, xiv, 116].

The Dipterous parasites and the diseases that attack *P. brassicae* are the subject of separate chapters, but they are dealt with much more briefly than the Hymenoptera.

du Buysson (H.). **Observations sur les premières galeries de ponte du** *Phloeotribus scarabaeoides* **Bernard** (*oleae* **Fabr.**).—*Misc. ent.*, xxix, no. 10, pp. 95–98. Castanet-Tolosan, June 1926.

In June 1926 *Phloeotribus scarabaeoides*, Bernard, was found in the South of France tunnelling into dry branches of ash that had been cut during the autumn. The formation of the gallery is described, both males and females assisting in its construction.

Ribaut (H.). **Caractères distinctifs de** *Eurygaster maura* (**L.**) **et de** *E. meridionalis* **Péneau** [**Hem.-Heteropt.**].—*Bull. Soc. Hist. nat. Toulouse*, liv, no. 1, pp. 103–112, 13 figs., 2 refs. Toulouse, 30th March 1926.

The morphological characters that serve to distinguish *Eurygaster maura*, L., from *E. meridionalis*, Pén., are enumerated.

Feytaud (J.). **La question doryphorique au début de la campagne 1926.**—*Rev. Zool. agric. & appl.*, xxv, no. 5, pp. 65–77, 2 maps. Bordeaux, May 1926.

The present situation in France with regard to the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] is discussed and illustrated by a map. During 1925 the infestation was considerably reduced where remedies were thoroughly carried out in the neighbourhood of the original infestation, but in the southern centres it has increased. Many isolated outbreaks have been entirely suppressed, but the extension of the pest to the Limousin frontier is serious, as this is one of the chief potato-producing areas and may encourage rapid increase of the insect. While the danger is great in all directions, Poitou, Limousin and la Marche require particularly strict inspection, and the author suggests propaganda that will bring to the knowledge of every grower the importance of the danger and the need for immediate action if the pest occurs.

Bichet (R.). **Particularités biologiques de la Cochylis et de l'Eudémis en Bourgogne.**—*Progrès agric. & vitic.*, lxxxvi, no. 34, pp. 183–184. Montpellier, 22nd August 1926.

The results of captures of second generation adults of the vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] in Côte-d'Or show that the maximum flights of either of these moths may occur at dates separated by an interval of several days, even in vineyards that are close together. Moreover, the maximum flights of the two species may be separated by as much as 16 days in a single vineyard. The practice of treatment against this generation once in a season at a fixed date is, therefore, useless, and the importance of correlating treatment with the seasonal history is explained.

TOPI (M.). **Sulle probabili cause del diverso comportamento della fillossera, specialmente gallecola, in rapporto ai vari vitigni americani.** [The probable Causes of varying Behaviour in *Phylloxera*, especially Gallicolae, as regards different American Vines.]—*Monitore zool. ital.*, xxxvii, no. 4, pp. 74–84, 2 refs. Siena, 7th May 1926.

Continuing the studies on *Phylloxera* already noticed [*R.A.E.*, A, xii, 188], investigations have been made to determine the cause of the different behaviour of the Aphids, especially gallicolae, on various American vines from different parts of Italy and Sicily. It is concluded that the difference is due to the varying origin of the insects, those from North Italy being direct gallicolae (from radicicolae adapted to an aerial life), while the others—from Tuscany, etc.—are indirect gallicolae (from the winter eggs). Infestations due to direct gallicolae appear to be quite common in Italy, especially in the North, and this probably applies also to the vine-growing regions of Central and Northern Europe. Direct gallicolae are differentiated (as noticed by Foà in 1908) from indirect ones by the length of the rostral bristles of the first larvae and by their different behaviour on the various vines. Direct gallicolae do not form galls on some American hybrid vines, though others are severely attacked, and they develop regularly and abundantly on them right up to the end of the year. The indirect gallicolae are known to produce galls on nearly all American vines. In the case of infestation by direct gallicolae, the roots of the American vines are infested. Further experiments are needed to ascertain if this infestation differs from that produced by indirect gallicolae.

It would appear that the hibernating individuals on the roots infested with direct gallicolae have longer rostral bristles than the hibernating individuals on vines infested with indirect gallicolae. Whether this influences the severity and duration of attack must be determined by further investigation.

It is confirmed that whereas the direct gallicolae do not produce a gall infestation on some American vines, nodosities are formed on their roots.

PAOLI (G.). **Revisione del genere** *Aspidiotiphagus* **How.**—*Boll. Soc. ent. ital.*, lviii, no. 7, pp. 97–105, 3 figs., 9 refs. Genoa, 30th July 1926.

The classification of the species of the Chalcid genus *Aspidiotiphagus* is discussed, and in conclusion a key is given to the three forms recognised by the author, *viz.*: *Aspidiotiphagus lounsburyi*, Berl. & Paoli; *A. citrinus*, Craw (*schoeversi*, Smits van Burgst); and *A. citrinus* var. *agilior*, Berl.

MASI (L.). **Descrizione di un nuovo** *Anthrocephalus* **della Somalia italiana (Hymen. Chalcididae).**—*Boll. Soc. ent. ital.*, lviii, no. 7, pp. 116–119. Genoa, 30th July 1926.

A Chalcid, *Anthrocephalus aethiopicus*, sp. n., is described from Italian Somaliland, where it probably parasitises a moth infesting stored cotton seed.

DE SEABRA (A. F.). **Sinópse dos Hemípteros Heterópteros de Portugal.**—*Mem. e Estudos Mus. zool. Univ. Coimbra*, Ser. 1, no. 1, fasc. iii, pp. 69–170, 96 figs. Coimbra, 1926.

This part of the author's synopsis of the Heteroptera of Portugal deals with the Pentatomids and includes the following list of injurious species, most of which attack cereals: *Eurygaster maurus*, L., *E. austriacus*, Schr., *Odontotarsus caudatus*, Burm., *O. purpureolineatus*, Rossi, *O. rugicollis*, Jak., *O. callosus*, Horv., *Aelia acuminata*, L., *A. rostrata*, Boh., *Eurydema ornatum*, L., *E. festivum*, L., *E. oleraceum*, L., and *Nezara viridula*, L. *Rhaphigaster nebulosa*, Poda, is a beneficial species, which attacks the larvae of *Galerucella luteola*, Mull.

[PAPACHRYSOSTOMOU (C.).]. **Entomological Notes.**—*Cyprus Agric. Jl.*, xxi, pt. 3, pp. 69–70. Nicosia, July 1926.

A third list of insects collected in Cyprus is given, which includes the following species not recorded in the two previous lists [*R.A.E.*, A, xiii, 167; xiv, 198]:—Coleoptera: *Rhizopertha dominica*, F., attacking stored barley; and *Sitona lineata*, L., on growing broad beans. Rhynchota: *Rhaphigaster nebulosa*, Poda, and *Mustha spinulosa*, Lefeb., collected on shelter bands on apple trees; and *Pyrrhocoris apterus*, L. Lepidoptera: *Syringopais* (*Nochelodes*) *temperatella*, Led., causing serious damage to wheat crops. Hymenoptera: *Dibrachys cavus*, Wlk., bred in a cage containing wheat; and *Monomorium gracillimum*, Sm., attacking the eggs, and *Tapinoma erratica*, Latr., attacking the larvae, of *Th*[*aumetopoea*] *wilkinsoni*, Tams.

GHOSH (C. C.). **Report of the Entomologist, Mandalay, and Sericultural Work for the Year ended 30th June 1925.**—10+8 pp. Rangoon, 1925. [Recd. August 1926.]

The only rice pest of any importance that occurred on a large scale was *Nymphula depunctalis* (rice case-worm), attacking the young plants in the seed bed and newly planted areas. It may be controlled by hand nets. Other pests recorded and not mentioned in the abstracts of the last two years' reports, etc. [*R.A.E.*, A, xii, 549; xiv, 38] include: *Phycita infusella*, *Eublemma olivacea* and *Epilachna dodecastigma*, on egg-plant; *Cricula trifenestrata*, on cinnamon leaves; *Coccus viridis*, on coffee; *Rhizopertha dominica*, *Laemophloeus pusillus* and *Tribolium castaneum*, in samples of malt barley; *Tortrix* sp. and *Prodenia litura*, occurring sporadically on cotton leaves; *Argyria tumidicostalis*, *Sesamia inferens* and *Diatraea venosata*, boring in sugar-cane stems; *Marasmia trapezalis*, on maize and *Sorghum*; *Diacrisia obliqua*, *Lamprosema indicata*, *Acherontia styx* and *Thermesia rubricans*, on beans; *Catochrysops cnejus*, on bean pods; *Pieris canidia* and *Plutella maculipennis*, on cauliflower; *Crocidolomia binotalis*, on radish; *Diaphania* (*Margarodes*) *indica*, on leaves of cucurbits; *Sphenarches caffer*, on leaves of bottle gourd; *Laphygma exigua* and *Heliothis peltigera*, on leaves of safflower; *Dasychira mendosa*, on lucerne; *D. securis*, on onion and mulberry; *Herse convolvuli*, on leaves of *Portulaca*; *Corynodes peregrinus*, on leaves of *Cordia myxa*; *Eublemma amabilis*, on lac; and *Nephopteryx semirubella*, on leaves of *Jatropha*.

Pachymerus (*Caryoborus*) *gonager*, usually attacking tamarind seeds in store, has been found breeding in the pods on the tree and also in pods of *Acacia farnesiana*.

BERNARD (C.). **Verslag** [Report] **over het Jaar 1925.**—*Meded. Proefst. Midden-Java*, no. 42, 22 pp. Salatiga, 1926.

The mealybugs [*Pseudococcus citri* and *P. virgatus*] were favoured by the prolonged dry weather in 1925, and infested both coffee and its shade-plants in Central Java. The Coccinellid, *Cryptolaemus montrouzieri*, was imported from the Besoeki Experiment Station, but proved ineffective against the mealybugs, probably because it was not numerous enough. Various sprays were tried, but did little good and were too costly for use except in the case of seed-beds.

The Bethylid [*Prorops nasuta*] imported from Uganda against the coffee-berry borer [*Stephanoderes hampei*] appears to have become established, as the number of parasites captured has steadily increased. When they are to be established on a plantation they are no longer placed in a cotton covering enclosing an entire coffee bush infested with the berry borer, but in an envelope enclosing only a heavily infested twig. In many cases infested coffee berries are taken and placed with the parasites in bamboo tubes closed with gauze.

VAN HALL (C. J. J.). **Ziekten en Plagen der Cultuurgewassen in Nederlandsch-Indië in 1925.** [Diseases and Pests of Cultivated Plants in the Dutch East Indies in 1925.]—*Meded. Inst. Plantenziekten*, no. 70, 51 pp. Buitenzorg, 1926.

Potatoes were attacked by *Phthorimaea operculella*, *Agrotis ypsilon* and *Epilachna*, while sweet potatoes in Java were infested by *Cylas formicarius* (*turcipennis*).

In forests *Xyleborus fornicatus* attacked *Schleichera trijuga*. Teak pests included *Xyleborus destruens*, *Duomitus ceramicus*, *Pseudococcus crotonis*, and a locust, *Valanga nigricornis*.

Cacao suffered little from the cacao moth [*Acrocercops cramerella*] and *Helopeltis*; but infestation of cassava by *Tetranychus bimaculatus* was favoured by the dry weather. Coca [*Erythroxylon coca*] on one estate was attacked by a twig-borer, *Xyleborus morstatti*.

Green manure and shade plants had a number of pests, including *Stephanoderes* spp. in pods of *Centrosema plumieri*; *Pseudococcus virgatus* on *Tephrosia*, *Calopogonium* and lamtoro [*Leucaena glauca*]; Jassids, probably *Typhlocyba erythrinae*, on *Erythrina* (dadap) and *Catochrysops* (*Lycaena*) *cnejus* in pods of *Crotalaria usaramoensis*. *C. rotalaria anagyroides* was severely injured on some estates by a bug, *Ragmus importunitas*, and was attacked by a twig borer, *Xyleborus coffeae*; the latter also occurred in *Leucaena glauca*. *Aphis medicaginis*, the caterpillars of *Deiopeia pulchella*, and the beetles, *Anomala viridis* and *Araecerus fasciculatus*, were other pests of green manure and shade plants.

Pests of vegetables included *Plutella maculipennis* on cabbages, and *Agromyza phaseoli* on beans. *Hevea* was attacked by *Setora nitens* and *Valanga nigricornis*. A sporadic infestation of cotton by *Earias fabia* occurred. Kédelé [*Glycine hispida*] was attacked by *Agromyza sojae* and *Etiella zinckenella*.

Cinchona pests included *Helopeltis antonii*, *Euproctis flexuosa*, found chiefly in plantations of older trees, *Metanastria hyrtaca*, usually parasitised by Tachinid flies, and *Attacus atlas* and *A. ricini*, the eggs of which were, however, parasitised by *Anastatus*. *Phassus damor* was very harmful in one instance, and mites (*Brevipalpus obovatus*, *Tetranychus bimaculatus*, etc.) occurred occasionally.

Coconuts were attacked by *Artona* (*Brachartona*) *catoxantha* and *Hidari irava*, while *Oryctes rhinoceros* and *Rhynchophorus* occurred near Batavia. In the island of Salajar infestation by *Aleurodicus* sp. reduced the yield of copra to about one-tenth of its normal amount. In the Talaud islands the Tettigoniid, *Sexava coriacea*, continued to do serious injury.

Coffee was attacked by *Stephanoderes hampei*, *Xyleborus coffeae*, *Pseudococcus citri*, *P. virgatus*, *Coccus* (*Lecanium*) *viridis* and *Brachytrypes portentosus*. The parasite, *Prorops nasuta*, is being bred on an increasing scale against *S. hampei*. The Nematodes, *Tylenchus coffeae* and *T. acutocaudatus*, seem to be more prevalent than was previously thought.

Rice pests included *Cirphis* (*Leucania*) *unipuncta* and a bug, *Podops vermiculata*.

Sugar-cane was attacked by the beetles, *Holotrichia helleri*, *H. leucophthalma*, *Anomala antiqua*, *Lepidiota stigma*, *Oryctes rhinoceros*, *Heteronychus morator* ?, and *Holaniara picescens*, the locust, *Aularches miliaris*, the Aphid, *Oregma lanigera*, the Coccids, *Chionaspis tegalensis* and *Pseudococcus calceolariae*, and a thrips that occurred in young fields that had suffered from drought.

Tobacco pests included *Phytometra signata*, *Tiracola plagiata*, *Agrotis* and *Phthorimaea operculella*, and a beetle, *Anomala* sp. The only insect pest of wheat recorded was *Cirphis unipuncta*.

Tea was attacked by the mites, *Eriophyes carinatus*, *E. theae* and *B. obovatus*. *Helopeltis*, *Phytorus* [*dilatatus*] and *Stauropus* occurred sporadically.

KALSHOVEN (L. G. E.). **Beschadigingen, Ziekten en Plagen van Mahonie** (*Swietenia mahagoni* **en** *S. macrophylla*), **aangeplant op Java.** [Injuries, Diseases and Pests of Mahogany grown in Java.] —*Meded. Inst. Plantenziekten*, no. 69, 126 pp., 22 pls. Buitenzorg, 1926. (With a Summary in English.)

The principal insect pest of mahogany, *Swietenia mahagoni* and *S. macrophylla*, in Java is the shoot-borer, *Hypsipyla robusta*, Moore [*R.A.E.*, A, viii, 165]. The native food-plant of this Pyralid in Java is *Cedrela sureni* ; *C. sinensis*, an introduced species, seems not to be attacked. Other food-plants have not yet been found. Regarding Beeson's record of *Citrus medica* as a food-plant, it may be noted that at Buitenzorg (Java) a moth very similar in appearance, *Nephopteryx robusta*, Moore, has been obtained from *Citrus* fruits.

The eggs are apparently laid separately on the youngest parts of the plants. On *S. macrophylla* the young caterpillars often first enter the leaf-petioles, but on growing larger they go to the top of the shoot. They pupate in a cocoon at the upper end of the burrow. They can also thrive on the young leaves, which are webbed together, and sometimes bore into the thick parts of bark at the base of the stem, near forks or at the border of a wound. Infestation of the fruits is rare. On *C. sureni* growing in a teak forest near infested mahogany no caterpillars could be detected in the inflorescences, but many were found in the fruits and in the shoots.

Development in mahogany shoots may occur at any time of the year. The total life-cycle is probably completed in 4–7 weeks, the pupal stage lasting about 10 days. The growth of mahogany saplings is periodic and the full-grown top-shoots end in a bud, which does not sprout before the youngest part has been lignified. During this period the top-shoot becomes more and more unsuited to the borer. Generally, full development is attained only in robust shoots, just full-grown or still sprouting at their ends, but the larvae migrate from unsuitable shoots. From the age of two or more years until the pole stage is reached, mahogany suffers the most serious injury ; the conditions before and after that period are less favourable to the borer. In the dry season, conditions are less favourable, the growth of the trees being retarded. In old trees, the periods of sprouting succeed at a slower rate and finally occur only once or perhaps twice a year, while the old leaves are shed previously. This makes it impossible for successive generations of the borer to breed in older stands. Mahogany in shaded situations suffers less than in open plantations.

The natural enemies of *H. robusta* include a parasitic fungus, Hymenopterous parasites, a predacious wasp (*Icaria* sp.), a Myriapod, ants and shrews. Preventive measures include the removal of sources of infestation ; a preference for *S. macrophylla*, which stands the loss of top-shoots better than *S. mahagoni* ; close planting as a deterrent to wide branching ; and the planting of mahogany with trees that grow more rapidly. This last measure opposes a mechanical obstacle to moths seeking mahogany tops for oviposition, it makes for slower growth of the mahogany in the dangerous first years, thus rendering the mahogany less suitable and attractive, and hinders branching.

The Scolytid shot-hole borers, *Xyleborus morigerus*, Bldf., and *X. morstatti*, Hag., injure the twigs and seedlings of mahogany. The leaves wither and the plants snap off at the place where the parent beetle has entered and formed a breeding chamber. Both species are ambrosia feeders. *X. morigerus* commonly attacks *Leucaena glauca*, teak, *Schleichera*, etc. *X. morstatti* has been found in *Coffea robusta* and is a serious pest of coca (*Erythroxylon*). *X. morigerus* has hitherto been always found in mahogany seedlings growing in the shade of other trees and never in the open. The loss of twigs on older trees is of no importance, but the death of a large percentage of seedlings under old stands may interfere seriously with the natural regeneration of a mahogany area. A Hymenopterous parasite is believed to be a useful check on *X. morigerus* in coffee plantations ; a similar parasite, possibly the same one, was found in *X. morstatti*. In the case of an infestation of natural growth of mahogany, success is said to have attended the destruction of affected plants every fortnight until the rest outgrew the injury.

Minor pests of mahogany, besides some already noticed [*R.A.E.*, A, x, 623], include a grey weevil, probably *Dermatodes aeruginosus*, Gyl. ; leaf-cutting bees, *Megachile* sp. ; and a Phasmid. Some young plantations suffered slightly during the outbreak in 1914–15 of the locust, *Valanga nigricornis*, Burm. A Pentatomid bug (*Podisus* sp.) feeds on the green parts of saplings, but does no harm.

Sonan (J.). **On *Morphosphaera* sp. (Chrysomelidae) injurious to *Ficus retusa*.** [*In Japanese.*]—*Formosan Agric. Rev.*, xx, no. 8, pp. 574–579. Taihoku, Formosa, August 1926.

The larvae and adults of a Galerucid beetle of the genus *Morphosphaera* are injurious to the young leaves and shoots of *Ficus retusa* in the spring in Formosa. There is one generation a year. The eggs are laid singly on the lower surface of the leaves from February to early May, and hatch in 7–11 days. The larvae are gregarious in the first two instars; they moult 3 times and mature in about 3 weeks, entering the soil for pupation. The prepupal stage lasts a week, and the adults emerge 10 days later. The adults eat the leaves, but soon begin to rest under the bark or among the roots of grasses, and remain dormant throughout the summer, autumn and winter until February of the following year, when mating and oviposition begin.

DUPONT (P. R.). **Insect Notes.**—*Seychelles: Ann. Rept. Dept. Agric. 1925*, pp. 3–4. Victoria, 1926.

Additional Coccids in coconut plantations [*R.A.E.*, A, xiv, 229] here recorded are *Phenacaspis* (*Chionaspis*) *inday*, *P.* (*C.*) *dilatata*, *Eucalymnatus* (*Lecanium*) *tessellatus* and *Vinsonia stellifera*. Measures such as burning the leaves and flaming the trees are being enforced in certain badly infested localities. Serious outbreaks of the scales can generally, however, be traced to bad condition of the palms as a result of lack of manure, etc.

The rhinoceros beetle [*Oryctes rhinoceros*] and *Melitomma* [*insulare*] are less troublesome than before, the former because all dead logs in which it breeds have been used for fuel, and the latter because many of the palms are walled in and earthed up to cover the adventitious roots on which the eggs are laid.

GOODE (M. C.). **Annual Report of the Department of Agriculture.**—*N. Territ. Australia: Rept. Administrator 1924–25*, pp. 20–21. Melbourne, 1926.

Platyedra (*Gelechia*) *gossypiella*, Saund., is the most serious pest of cotton in the Territory. It should be possible to control it by adopting special precautions at the ginnery and the application of winter fallow and crop rotation. Peanuts [*Arachis*] are suggested as the most suitable rotation crop.

MILLER (D.). **Parasites of the Pear-midge** (*Perrisia pyri*). **First Attempt at their Establishment in New Zealand.**—*N.Z. Jl. Agric.*, xxxii, no. 6, pp. 379–393, 9 figs., 6 refs. Wellington, 21st June 1926.

During the summer of 1925 R. C. Fisher found that *Perrisia pyri*, Bch. (pear leaf-curling midge) in the vicinity of Bordeaux was parasitised by *Platygaster* sp.; in July and August 1925, J. G. Myers found the same species of *Platygaster*, also another Platygastrid, *Inostemma* sp., and several Chalcids, belonging to one or more species, parasitising *P. pyri* near Paris, and sent a consignment of pear leaves attacked by the midge in cool storage to New Zealand. Myers found 58 per cent. of the larvae of *P. pyri* to be parasitised by *Platygaster*, which is an internal parasite, as is also *Inostemma*, the eggs of both species being laid in the eggs of the host. The Chalcids are external parasites of the larvae. In October a further consignment of pear leaves infested by *P. pyri* parasitised by *Platygaster* was sent from France to New Zealand by Fisher.

The emergence boxes, insectary, and methods employed in rearing and studying the parasites from the material sent to New Zealand are described. The material was removed from cool storage on various dates from October to December, and *P. pyri* and parasites emergec during December and January; a record of all the emergences o parasites is given. No *Inostemma* and only one Chalcid emerged, bu 46 females and 26 males of *Platygaster* were obtained, most of whicl were liberated either in an insectary or in an orchard containing pea trees infested with *P. pyri*. The emergence of the parasites coincidec closely with that of the hosts, which extended from a few day before the appearance of the first *Platygaster* to a few day after the appearance of the last. Female *Platygaster* were observec ovipositing in the eggs of *P. pyri*; eggs laid on 13th January producec four adult males on the 16th and 20th February, so that it appears tha the life-cycle of the parasite is similar to that of the host, which take approximately a month to develop from egg to adult.

HERMS (W. B.). *Diocalandra taitensis* **(Guérin) and other Coconu Pests of Fanning and Washington Islands.**—*Philippine Jl. Sci* xxx, no. 2, pp. 243–274, 8 pls., 3 figs., 8 refs. Manila, June 1926.

Fanning and Washington Islands are part of a group lying abou midway between the Hawaiian and Society Islands; their topograph climate and vegetation are discussed. Of the 3,200 acres of coconu palms on Fanning Island, about one third is occupied by wild tree but of the 2,100 acres on Washington Island, only about 200 acres a planted. The most important pest occurring at present is *Diocaland taitensis*, Guér., which bores into the healthy plant tissue, attackin the fronds, trunks, spikes, spikelets and young nuts. This weev does not readily attack trees under three years of age. Its distributio on the islands suggests that it was introduced.

The coconut is apparently the only food-plant. The greatest damag is done when the larvae attack the spikelets, more especially the base the spike itself, often causing total loss of all the nuts. Though *taitensis* may not be directly responsible for the death of a tree, t injury caused by it combined with other factors, particularly attack caterpillars, may result in such a badly twisted and dwarfed conditio that the tree should be cut down and burnt immediately.

The various stages of *D. taitensis* are described, also the method collecting them for laboratory observations. The eggs may be found various places, such as the crevice of a more or less split frond whe decay has already set in, at the base of the frond, between the shea and the base of the spike, etc. They are laid in scattered masses of fro 11 to 31, also frequently singly, and hatch in from $4\frac{1}{2}$ to $8\frac{1}{2}$ day Field and laboratory observations indicate a larval period of 8-10 week Pupation occurs in an enlarged burrow near the surface, and the pup stage lasts 10–12 days. The period from the egg to the appearance the adult is therefore 10–12 weeks.

The removal of the borers by cutting out infested parts or removi the entire frond seems the most reasonable remedial measure, but must be followed by the destruction of such débris as, unless it is ve small, the development of the larva will continue successfully. T part of the tree thus injured must be treated with carbolineum prevent reinfestation. Frequent and systematic inspection of all tre up to 10–12 years of age is urged, so that particular attention may given to the infested trees, which if very heavily attacked should be c down and burnt. There are apparently no natural enemies of *D. taitensis* on the islands, and the search for and introduction of parasites from elsewhere is suggested.

Other insects occurring on coconuts on the islands are *Pinnaspis* (*Hemichionaspis*) *aspidistrae*, Sign., not of any great economic importance at present, and parasitised by *Aspidiotiphagus citrinus*, Craw; *Pseudococcus pandani*, Ckll., not abundant enough to cause much damage; and the Oedemerid beetles, *Ananca collaris*, Sharp, and *A. decolor*, Fairm., which are found in numbers on the coconut palms, but are of little importance as they probably breed in rotting wood, although the adults feed on pollen. Unidentified Lepidopterous larvae cause considerable damage to young trees, infesting the folds of the leaflets, the trees being often killed. A brief description of their habits and appearance is given. A weevil, *Oxydema fusiforme*, Woll., is found under the leaf sheaths, but causes no appreciable injury; and *Xyleborus confusus*, Eich., occurs in fallen nuts. *Necrobia rufipes*, F., sometimes breeds in copra, but does not cause much damage.

WELLHOUSE (W. H.). **How Insects Live. An Elementary Entomology.**—8vo, xv+435 pp., 333 figs., numerous refs. New York, The Macmillan Co., 1926. Price $5.

The object of this book is to provide a basis for a course of general entomology to precede courses in economic entomology in schools. The first two chapters are introductory and contain a brief general survey of the science of entomology and an account of insect physiology and anatomy. The main part of the book consists of descriptions of the life-histories of individual species of insects, mostly those occurring commonly in North America, to illustrate the characteristics of the various orders; in many cases these accounts are very full, and important details of morphology are brought into them. The author has adopted this plan believing that a student learns more from detailed accounts of a few species than from generalised accounts of families. A chapter is devoted to the treatment of each order, and contains a few introductory paragraphs followed, except in the case of the smallest and least important orders, by accounts of one or more species; a few selected references to papers on the subjects dealt with are given after each.

Subsequent chapters include: a list of the families of the class Insecta, arranged systematically, the name of each being followed by a few words describing its habits or appearance; an account of the phylum Arthropoda, the classes of which are briefly discussed, special attention being paid to the spiders; suggestions for collecting insects; and keys to the principal orders and families of adult insects, to the orders of some larvae, and to some of the families of Lepidopterous and Coleopterous larvae.

BOUTIN (A.). **Quelques insectes ravageurs de nos bois. I. Le scolyte de l'épinette** (*Dendroctonus piceaperda*).—*Nat. canad.*, liii, no. 1, pp. 7–14, 7 refs. Quebec, July 1926.

This account of the bionomics and control of the spruce bark-beetle, *Dendroctonus piceaperda*, Hopk., in Canada is based on the work of Swaine [*R.A.E.*, A, xiii, 189], Hopkins, and others. *Bracon simplex*, Cress., and a Clerid, *Thanasimus nubilus*, Kl., have been recorded as natural enemies of *D. piceaperda* [in Maine].

Bailey (H. L.). **Important Tree Insects of Vermont.**—*Vermont Dept. Agric.*, Bull. 35, ii+51 pp., 45 figs. Montpelier, Vt. [1925.] [Recd. August 1926.]

This bulletin is designed to serve as a handbook for the identification and control of the insects that the author has found, in the course of observations extending over twelve years, to be the most prominent pests of trees in Vermont. The species discussed are those that attack common shade and ornamental trees, including the apple, and the best forest trees, and are important on account, either of their injuriousness or, in a few cases, of the attention that they attract by being conspicuous. Following brief general accounts of insects and control measures, notes on the life-history, distribution and control of the various species, treated either separately or in appropriate groups, are given, under the general headings of leaf-eating, sucking and boring insects, 27 species of Lepidoptera, 2 Chrysomelids and 4 Tenthredinids being dealt with in the first group, 5 Aphids and 2 Coccids in the second, and 6 Coleoptera and 2 Lepidoptera in the last.

Chittenden (F. H.). **An introduced Beetle, related to the Tomato Weevil.**—*Proc. Biol. Soc. Washington*, xxxix, no. 20, pp. 71–74, 1 pl., 11 refs. Washington, D.C., 30th July 1926.

The weevil, *Listroderes apicalis*, Waterh., which is closely allied to the tomato weevil, *L. obliquus*, F., and is believed to be parthenogenetic, is recorded from beet in Louisiana, where it was not observed in the field later than the middle of July.

Leach (B. R.). U.S. Bur. Ent. **Experiments with certain Arsenates as Soil Insecticides.**—*Jl. Agric. Res.*, xxxiii, no. 1, pp. 1–8, 5 refs. Washington, D.C., 1st July 1926.

Various arsenates have been tested under laboratory conditions for the destruction of the larvae of *Popillia japonica*, Newm., in the soil. Basic lead arsenate, magnesium arsenate and ferric arsenate were not toxic to the larvae. Zinc arsenate and copper arsenate killed them more slowly than acid lead arsenate and calcium arsenate. As acid lead arsenate gave the best results, it was further tried in outdoor experiments. It was applied at the rate of 1,000, 2,000, and 3,000 lb. to the acre. At a given concentration of arsenate, the rapidity of effect depends on the soil temperature, the larvae being relatively inactive at temperatures below 50° F. All larvae placed in the soil were killed before pupation; the adults laid eggs indiscriminately in the treated and untreated soil, but the larvae hatching in the poisoned soil died very soon afterwards. Many of the plants tested showed considerable tolerance for the poison, but others were severely checked in growth. The acid lead arsenate undergoes certain changes when mixed with the soil, the presence of soluble arsenic is indicated by the stunting of plant growth, and the formation of insoluble basic arsenates by a certain degree of loss of toxicity towards the larvae.

Acid lead arsenate at the rate of 1,500 lb. per acre is being used in nurseries to keep the soil free of larvae; the ultimate effect on the soil so treated is not yet known, and it is therefore urged that only the minimum area of ground be so treated. The results of experiments in coating the particles of lead arsenate for the purpose of resisting soil action have been negative so far.

Willard (H. F.) & Bissell (T. H.). U.S. Bur. Ent. **Work and Parasitism of the Mediterranean Fruit Fly in Hawaii in 1921.**—*Jl. Agric. Res.*, xxxiii, no. 1, pp. 9–15, 9 refs. Washington, D.C., 1st July 1926.

This is a continuation of the work on the parasites of *Ceratitis capitata*, Wied., in Hawaii [*R.A.E.*, A, xi, 561]. The work of the 6 years, 1916–1921, is reviewed. The proportion of fruits of various kinds with more than average infestation steadily decreased from 1916 to 1920, but increased in 1921, which was also the year of greatest abundance of the parasites since their liberation. During this year, *Opius humilis*, Silv., was the most effective species for one month, *Diachasma tryoni*, Cam., for 6 months, and *Tetrastichus giffardianus*, Silv., for 5 months. There appears to be a steady increase in the relative importance of the last-named species. *O. humilis* has steadily decreased in effectiveness since 1915 [*cf.* *R.A.E.*, A, vi, 185], both *D. tryoni* and *D. fullawayi*, Silv., being responsible for its gradual destruction. Though it may never be eliminated from Hawaii, it will gradually become the least effective of the four parasites. *D. tryoni* was responsible for 47·7 per cent. of the total parasitism in 1921.

The average yearly parasitism by all four parasites for the 5 years 1917–1921 has been approximately 50 per cent.

Fleming (W. E.). U.S. Bur. Ent. **A Homogeneous Carbon Disulphide Emulsion.**—*Jl. Agric. Res.*, xxxiii, no. 1, pp. 17–20, 6 refs. Washington, D.C., 1st July 1926.

Carbon bisulphide, emulsified in water by means of soap, is being used for the destruction of the immature stages of *Popillia japonica*, Newm., in the soil. All of these concentrated carbon bisulphide-water emulsions tend to stratify into two or more layers of different composition, which must be agitated to form homogeneous mixtures. Experiments were therefore undertaken in order to obtain a more satisfactory emulsion by substituting some other liquid for the water. As a result of tests with different substances the following formula proved the best: carbon bisulphide 700·00 cc., ethyl alcohol (95 per cent.) 214·40 cc., oleic acid 85·60 cc. and potassium hydroxide 14·88 gm. In this the ethyl alcohol takes the place of the water, while the potassium oleate that is formed enables more carbon bisulphide to be used and increases the stability of the emulsion when mixed with water. Further experiments were made to determine whether the dispersion of the carbon bisulphide in water could be facilitated by the addition of oils or fatty acids to the concentrated emulsion. As a result, the above formula has been modified as follows: carbon bisulphide 700 cc., oleic acid 77 cc., ethyl alcohol (95 per cent.) 193 cc., cottonseed oil (purified) 30 cc. and potassium hydroxide 13·5 gm. To prepare a litre of this emulsion an excess of potassium hydroxide is dissolved in alcohol, the insoluble carbonate is filtered off, and after determining the hydroxide content by titration against a standard acid, sufficient alcohol is added to obtain a concentration of 13·5 gm. potassium hydroxide in 193 cc. alcohol, the oleic acid, carbon bisulphide and cottonseed oil are then added. This emulsion is readily measured in small quantities, is homogeneous over a relatively long period and mixes well with water. It should be diluted with an equal volume of water before mixing with the actual amount of water needed for treatment.

CHAMBERLIN (F. S.) & TENHET (J. N.). U.S. Bur. Ent. ***Cardiochiles nigriceps* Vier., an important Parasite of the Tobacco Bud Worm, *Heliothis virescens* Fab.**—*Jl. Agric. Res.*, xxxiii, no. 1, pp. 21–27, 4 figs., 2 refs. Washington, D.C., 1st July 1926.

The Braconid, *Cardiochiles nigriceps*, Vier., is an important parasite of *Heliothis virescens*, F. (tobacco bud-worm) in northern Florida and southern Georgia. Its numbers remain fairly constant from year to year, and *H. virescens*, which may be attacked on tobacco or beggar-weed (*Meibomia* sp.), is apparently its only host. The different stages of the parasite are described. The duration of the early stages could not be ascertained, but the combined incubation and larval periods (including the prepupa) vary from 17 to 21 days in midsummer. The larva feeds within the body of the host, which is always destroyed before it can pupate. *C. nigriceps* pupates in the soil, the pupal period ranging from 8 to 12 days in the summer.

The adults are most active in bright warm weather and prefer the young stages of the host larva for oviposition. In two instances oviposition was attempted on young larvae of *Protoparce sexta*, Joh., without affecting the host. Presumably only one egg is deposited in each larva, and there are probably 3 or 4 generations a year in Florida.

Cage and field observations indicate that the winter is passed in the pupal stage in the soil.

SMITH (R. C.) & DAVIS (E. W.). **The Pea Aphid as an Alfalfa Pest in Kansas.**—*Jl. Agric. Res.*, xxxiii, no. 1, pp. 47–57, 3 figs., 7 refs. Washington, D.C., 1st July 1926.

The land under lucerne in Kansas has decreased from 1,360,000 acres in 1915 to 884,000 in 1924, in which connection *Illinoia pisi*, Kalt (pea aphis) is an important factor. This Aphid is apparently extending its range of food-plants and is likely to become one of the most destructive lucerne pests. The observations described were made over a period of 5 years, the first outbreak having occurred in the spring of 1921.

Field observations correlated with insectary records suggest that a temperature of about 65° F., with a humidity of about 80 per cent. provides the optimum conditions for the Aphid. It is thus most abundant in April, May, September and October. It is, however present during the entire year in lucerne fields. The winter is passed mainly as an apterous viviparous female, though sometimes in the egg stage. The adults survive best in protected parts of the field in low areas, or in sheltered fields, though heavy growths of lucerne seem to be sufficient protection. The overwintering eggs occur in considerabl numbers on both surfaces of the leaves and on the stems of the plants

The numbers and the activity of the Aphids in the field are largely controlled by climatic conditions. They apparently thrive best when the winter is mild and relatively dry. There is a strong indication in Kansas that lack of rain in March is an important factor in increasing liability of damage to lucerne. As spring advances, the percentage of winged individuals increases, presumably so that they can disperse a they become overcrowded or the lucerne plants weaken. This condition may be partly cyclical, but the Aphids always leave the plants before the latter are dead. During the summer, the Aphids are scarc in the field, apparently mainly owing to the high temperatures and low humidity, though natural enemies may also be a factor. In the outbreaks under discussion, the fungus disease [*Empusa aphidis*] appeared to be of less importance than Coccinellids [*cf. R.A.E.*, A, iv, 34].

The other food-plants of *I. pisi* are briefly discussed [*cf. R.A.E.*, A, iv, 339], and details are given of insectary records on the first appearance of the young and their respective number under varying conditions.

BRINLEY (F. J.). U.S. Bur. Ent. **Insecticidal Value of certain War Chemicals as tested on the Tent Caterpillar.**—*Jl. Agric. Res.*, xxxiii, no. 2, pp. 177–182. Washington, D.C., 15th July 1926.

The work reported on was conducted in co-operation with the Chemical Warfare Service in 1924. As a large number of compounds were to be tested, no attempt was made to determine their exact toxicity, and the results obtained with 10–25 individuals of *Malacosoma americana*, F. (eastern tent caterpillar) were considered a sufficient basis for further study.

In the tests as stomach poisons the chemicals were sprayed or dusted on the leaves of small twigs of wild cherry, the branches being placed in water. The effect on the plant was determined by tests with beans grown in pots, as they are very susceptible to arsenical injury. The twelve compounds tested were largely organic arsenicals, many being oxides of gases and smokes developed during the war. The cost was not taken into consideration, and this in many cases would prohibit their use as insecticides. A list of the various compounds is given, with a brief description of their chemical and physical properties.

Diphenylamino arsenious oxide, $[NH(C_6H_4)_2AS]_2O$, proved the most promising of the materials tried. It was equal to lead arsenate in toxicity to *M. americana* and caused no injury to the plants even in strong concentrations. It mixes well with water, if first made into a paste, and spreads evenly on foliage. The pure material dusted on the plants caused slight injury after several days, especially to the tender leaves and growing tips, but when mixed at the rate of 1 part to 10 of kaolin, there was no injury and the larvae were killed. It is a contact as well as a stomach poison, and further experiments with it are now in progress.

GODFREY (G. H.). **Effect of Temperature and Moisture on Nematode Root Knot.**—*Jl. Agric. Res.*, xxxiii, no. 3, pp. 223–254, 17 figs., 7 refs. Washington, D.C., 1st August 1926.

The experiments described in detail bear out general observations suggesting that climate is one of the limiting factors in the distribution of the root-knot nematode, *Heterodera radicicola*, Greef. With a soil temperature below about 16° C. [60·8° F.] there is considerably less root-knot than at temperatures even only 2–3 degrees higher, and at 10 and 12° C. [50 and 53·6° F.] infestation is very rare. Different crops vary to some extent in the amount of infestation at the points near the critical temperature, but the similarity in effect on all plants studied indicates that the reaction to temperature is on the part of *H. radicicola* rather than the plants.

It is suggested that greenhouse temperatures might be adjusted with a view to controlling infestation, and that plants that grow well at low temperatures might be grown on infested ground at a time when the temperature is too low for the Nematodes. Winter vetches should be useful for the improvement of the soil, at least in localities where their principal period of growth would be below the critical temperature for Nematode infestation.

Moisture is apparently of little importance in the distribution of the Nematode so long as the moisture content of the soil is favourable to the growth of the crops. Within the range of 40–80 per cent. of the moisture-holding capacity of the soil there is very little difference in root-knot development. Considerable infestation occurs below and above these conditions.

LEACH (B. R.) & LIPP (J. W.). U.S. Bur. Ent. **A Method of Grub-proofing Turf.**—*Bull. Green Sect. U.S. Golf Assoc.*, vi, no. 2, pp. 34–39, 4 figs. Washington, D.C., 16th February 1926. [Recd. September 1926.]

The application of acid lead arsenate to golf greens as a protection against the larvae of the Japanese beetle [*Popillia japonica*, Newm.] and other insects and also earthworms appears to be entirely satisfactory [*R.A.E.*, A, xiv, 526].

The poison should be applied before the seed is sown. The powder is spread evenly over the soil when it is fairly dry, at the rate of $3\frac{1}{2}$ lb. per 100 sq. ft., and thoroughly worked in to a depth of about 4 inches. The seed can then be sown as usual. Future top-dressings must be made with poisoned soil in order to maintain the surface layer. The poison should be mixed with the top-dressing at the rate of $2\frac{4}{5}$ lb. per cu. yard. The application of poisoned top-dressings and the action of fertilisers requires further study.

Some species of grasses do not grow well in the poisoned soil, but in the case of others, though the germination of the seed or stolons and the subsequent growth are slower in the poisoned soil, at the end of 6–8 weeks no difference can be noticed. The effect of the poison in the soil lasts for at least 3 years, and probably very much longer.

VORHIES (C. T.). **Life History and Habits of the Thurberia Bollworm,** *Thurberiphaga diffusa* **Barnes (Noctuid).**—*Arizona Agric. Expt. Sta.*, Tech. Bull. 7, pp. 141–163, 5 figs., 15 refs. Tucson, Ariz., 1st February 1926. [Recd. August 1926.]

In view of the fact that Arizona wild cotton (*Thurberia thespesioides*) occurs commonly in the mountains of Arizona in the vicinity of cultivated cotton (*Gossypium*), to which it is closely related, the thurberia bollworm, *Thurberiphaga diffusa*, Barnes (*catalina*, Dyar), was regarded as a potential cotton pest in the State, especially as two other insects attacking *T. thespesioides*, a boll weevil, *Anthonomus grandis thurberiae*, Pierce, and a Tineid, *Bucculatrix thurberiella*, Busck (cotton leaf perforator), are known to attack cultivated cotton.

This bulletin presents the results of field and laboratory studies of *T. diffusa* extending over five years. All stages are described and illustrated. The distribution of *Thurberia* has been studied by Hanson [*R.A.E.*, A, xii, 208], and only some additional notes are given here; a map shows all the localities in Arizona from which *T. diffusa* has been recorded. *Thurberia* almost invariably begins to flower about 25th August, fruiting in September, and the life-cycle of *T. diffusa* is closely correlated with the development of its food-plant; 1914, the year in which investigations on *Thurberia* were made by Coad [*R.A.E.*, A, iv, 125], appears to have been quite exceptional in this connection, the early flowering of the plants being probably due to lack of rainfall in the early part of the year.

The moths normally begin to appear about 15th August, and are present in fair numbers for about a month. The eggs are laid singly on the tips of leaves or bracts and hatch in 6 days. Moths refused to oviposit in captivity, and experiments to test the relative attractiveness of cotton and *Thurberia* for oviposition were rendered exceptionally difficult; no eggs were, however, laid on cotton planted in the mountains within 50 yards of a spot where both moths and *Thurberia* occurred, and it seems probable that *T. diffusa* will not voluntarily oviposit on cotton and that there is little danger of natural infestations occurring.

A larva on hatching enters a bud, after first spinning a bond of silk between the base of the flower stalk and the stem of the plant, in order to prevent the bud from dropping when injured, as the soil temperature, which may reach 180° F., would be fatal to any larva in a bud that fell to the ground. The first moult takes place after two or sometimes three days in the bud first attacked, which is by that time hollowed out; subsequently the larva enters and usually completely hollows out from one to four buds and from three to six bolls. Occasionally a larva entered a young boll on hatching. About the beginning of October the larvae enter the soil and construct cocoons in which to pupate. A case in which the pupal stage lasted for 22 months instead of the normal 10 is on record, and it seems likely that this may occur to a considerable extent in exceptionally dry seasons.

Eggs transferred from *Thurberia* in the open to the same plant growing under screens resulted in normal infestations of the latter, but no infestation resulted from 390 eggs similarly placed on cotton. Newly hatched larvae placed on cotton squares mostly failed to enter the buds, and the few that did effect an entry failed to complete their development. Later stage larvae (probably mostly third instar) placed on cotton reached maturity in the buds or bolls, but there is no means by which such transfers would be likely to occur in nature, and it is concluded that *T. diffusa* is not a potential pest of cotton.

TOWNSEND (C. H. T.). **Methods of Environment Work for indicating Insect-control Measures.**—*Ecology*, vii, no. 3, pp. 326–337, 4 refs. Brooklyn, N.Y., July 1926.

Believing that ecological investigations furnish the only sure basis for insect control measures, and that the most perfect control of injurious insects is obtainable by manipulating certain factors of environment with reference to the insect in question, the author has devoted much study to the analysis of environment into its constituent elements and the response of insects to them. The present paper contains a summary of the analysis of environment and discussions of the instruments and methods used in measuring the values of the factors that the analysis shows to be of importance in determining insect response, with special reference to cotton insect problems that the author is investigating in Peru.

The constituent elements of the environment of an organism are analysed as being of three classes, *viz.*: media, factors, and controls. The media are air, water and soil, and certain food substances within which the organism may live; the factors are heat, sunlight, rainfall, atmospheric humidity and pressure, winds, soil texture and moisture, vegetation, food, enemies and diseases ; the controls are topographic and climatic conditions that influence the factors. It is the factors that require measurement, so that their values may be expressed on appropriate scales. Physical factors are measured by instruments, but organic factors must be computed.

From the standpoint of insect control, only those factors are of importance that present a scale of effective variations or are susceptible to variation, produce physiological response (metabolic or tropic), and are controllable artificially. Responses to heat and humidity may be determined in an incubator that admits light freely, but not air, screen cages enclosing plants are suitable for determining responses to sunlight and wind, and potted plants in the cages the responses to soil moisture and texture ; responses to food, enemies and diseases should be observed under field conditions. The physiological optimum for heat may be the same for both tropic and metabolic responses of a given species, but need not necessarily be so, hence the term should be confined to cases in which the tropic and metabolic optima are the same.

Flint (W. P.) & Larrimer (W. H.). **The Chinch Bug and how to Fight it.**—*U.S. Dept. Agric.*, Farmers' Bull. 1498, 16 pp., 6 figs. Washington, D.C., June 1926.

The life-history of *Blissus leucopterus*, Say, in the United States is described, and the various remedial measures employed are discussed. Most of the information has already been noticed from other sources [*R.A.E.*, A, x, 206 ; xiv, 166 ; etc.].

Watson (J. R.). **Ecological and Geographical Distribution of Thysanoptera of Florida.**—*Florida Ent.*, x, no. 2, pp. 21–24 & 27. Gainesville, Fla., July 1926.

Over 80 species of Thysanoptera have been recorded in Florida, and the food habits of the majority of these are fairly well known, 65 being phytophagous and 12 mainly predacious; some of the plant-feeding species are, however, occasionally predacious. Lists are given of the species living in various situations : on the leaves of grasses, on the leaves and shoots of other plants, in flowers, and under bark. While a few species are confined to a single species or genus of plants, more have a wide range of food-plants, and distribution does not appear to correspond with ecological formations ; in the case of species that inhabit flowers the most important point seems to be that they should be well concealed. Phototropism is sometimes a factor in determining local distribution ; *Frankliniella tritici*, Fitch, var. *bispinosa*, Morg., is more abundant on the south side of an orange tree than elsewhere, unless it is shaded, and rarely occurs in the interior of a tree. Fifteen species of Florida Thysanoptera belong apparently to the Neotropical fauna, and their spread northward may be limited by temperature. The distribution of the remainder has little connection with life zones, as 17 are found as far north as Massachusetts, while only five occur in California or Arizona ; five are common to northern Europe and North America.

TISSOT (A. N.). **Some Observations on the Life History of the Citrus Aphid** (*Aphis spiraecola* **Patch**).—*Florida Ent.*, x, no. 2, pp. 26–27. Gainesville, Fla., July 1926.

Further investigations on the life-history of the citrus aphis, *Aphis pomi*, DeG. (*spiraecola*, Patch) [*R.A.E.*, A, xiii, 324] in Florida were made out of doors in the autumn of 1925 and the winter and spring of 1926, the results differing somewhat from those obtained under insectary conditions. The average development period of the Aphids was 8·8 days in November, 13 days in March, 7·1 days in the first part of April, and 6·7 days in the first part of May. The average daily and total numbers of young produced by each female were 2·7 and 34 in November, 3·9 and 62·9 in March, 4·1 and 70·8 in April, and 4·1 and 40·9 in May. The most important factors governing the rates of development and reproduction are the condition of growth of the leaves, and weather conditions, particularly temperature. Reproduction and development are more rapid on leaves that are tender and succulent than on those that are more nearly mature. In March, when the mean temperature was 54·8° F., the nymphal period lasted 13 days, while in the first half of May, with a mean temperature of 73·2° F., it only lasted 6·7 days. During the second half of May, however, when the mean temperature was 90° F., the average number of young produced by each female was only 26·7 as against 55·8 in the first half. The leaves were more mature in the latter part of the month, but the decrease was noticed also on the few tender shoots remaining. The result of hot weather is, therefore, to reduce infestation.

[WATSON (J. R.).] **A New** *Haplothrips* **from Abyssinia.**—*Florida Ent.*, x, no. 2, pp. 28–29. Gainesville, Fla., July 1926.

Haplothrips abyssianae, sp. n., is described from specimens from *Sorghum* seed from Abyssinia.

DUNNAM (E. W.). **Cotton Boll Growth in Relation to Boll Weevil Injury.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 589-593. Geneva, N.Y., August 1926.

The following is taken from the author's summary : This paper gives evidence that as the cotton bolls grow older, they are less susceptible to injury by *Anthonomus grandis*, Boh. (boll weevil), and the immunity at given ages varies with the variety. There is no correlation between the number of feeding punctures or the number of egg punctures and the percentage of cotton loss. Neither is there any relation between the thickness of hull and susceptibility to weevil damage, in spite of the fact that the weevils lay fewer eggs in the thick-hulled varieties. The determining factor is the hardness of bolls, because varieties with the hardest bolls, as determined by the number of grams pressure required to puncture them, show also the lowest percentage of cotton loss.

GEHAUF (B.). **The Breeding of Boll Weevils from Infested Cotton Squares.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 593–599, 2 figs. Geneva, N.Y., August 1926.

The method that was found best for the production of large numbers of *Anthonomus grandis*, Boh. (cotton boll weevil) for experimental purposes is described. Breeding and oviposition were carried out in the field under natural conditions, and hatching in incubators. It was found that too much moisture caused the squares to rot before the weevil had reached its full growth.

Hinds (W. E.). **Boll Weevil Control Results for 1925** (*Anthonomus grandis*, **Boh.**).—*Jl. Econ. Ent.*, xix, no. 4, pp. 599–600. Geneva, N.Y., August 1926.

The uniform conditions of excessive heat and drought in 1925 in the cotton growing districts of the United States had a remarkable effect on the abundance of *Anthonomus grandis*, Boh. (cotton boll weevil). At the beginning of the season the weevils were fairly abundant, but during the time when they are usually most harmful they were practically eliminated by weather conditions. In the autumn the numbers increased in some localities, and sufficient weevils hibernated to form a distinct menace in 1926, if weather conditions are normal. Under the conditions of 1925, dusting was almost unnecessary. It was found that the cotton aphis [*Aphis gossypii*, Glov.] was more abundant on dusted than on untreated fields.

Walker (H. W.) & Mills (J. E.). **Progress Report of Work of the Chemical Warfare Service on the Boll Weevil,** *Anthonomus grandis*.

Mills (J. E.). **Recommendations regarding Boll Weevil Work.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 600–602. Geneva, N.Y., August 1926.

The abstracts only of these papers are published, and the following is taken from them : Preliminary tests have been made on some 1,000 poisons or poisonous mixtures against *Anthonomus grandis*, Boh., and about 50 of these have shown a toxicity equal to or greater than calcium arsenate. About 20 of these materials show little or no injury to the cotton plant. A total of 100,000 weevils was used in the tests made.

Barium, lead, zinc, mercury and to a less extent iron, have shown some measure of toxicity to the boll weevil when combined with other chemical groups in themselves harmless, and the toxicity of these metals seems, in general, to be retained when combined with arsenic, and to increase the toxicity of the resulting arsenical. Sodium fluosilicate, barium fluoride and cryolite seem to be as effective as calcium arsenate, measured by volume. These substances should be subjected to further careful and extensive field tests to determine their exact value, using 10 to 15 lb. to an acre. Every effort should be made to lessen the density of these poisons so that the amount used to the acre can be decreased.

It is believed that an advantage will be gained if the percentage of arsenic in calcium arsenate is reduced and a larger amount used to the acre. Arsenic trioxide or arsenic pentoxide, in relatively small percentages, adsorbed on coal dust or some similar vehicle, may make an effective economical poison against the boll weevil if some agent such as oil be used to prevent scorching. Only occasional scorching is produced by 1½ per cent. arsenic trioxide on coal dust. It is recommended that field tests using this amount of arsenic trioxide on coal dust at the rate of 10 to 15 lb. an acre be tried. The weevil seems to get most of the poison by more or less accidentally coming into contact with the dust particles and subsequently taking them into its system, but does obtain some poison through its food and drink.

High concentrations of toxic gases are ineffective against the weevil, owing to its apparent ability to suspend breathing. There may still be a possibility that low concentrations of a persistent cumulative gas on adsorbents may give effective control. The amount of arsenic in the best available form (soluble As_2O_3) necessary to poison a weevil is estimated as about 0·00015 mg. The average weight of a boll weevil is 16 mg. The average quantity of water drunk daily is roughly estimated as 0·0025 cc. (2·5 mg.), and the air breathed by a weevil in an hour is very roughly estimated as 0·46 cc.

The work has emphasised the necessity for the very careful management of dusting machinery so as to secure an even distribution of the poison over the plant. A calm or a very slight wind is a necessity. The cotton plant should be moist if calcium arsenate is used. For the time being it is recommended that the method of control as described by the Southern Agricultural Workers Association, using calcium arsenate as a dust, or in special cases as a syrup mixture, be strictly adhered to.

Cory (E. N.). **The New Day in Entomology.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 603–606. Geneva, N.Y., August 1926.

The author reviews the beginnings of economic entomology and its expansion to its present high state of efficiency, and comments on the improvement due to co-operation in the research, educational, extension and regulatory fields. He considers that this co-ordination of work offers the best avenue for increasing the efficiency of entomological effort.

Hinds (W. E.). **Airplane Dusting of Cotton for Boll Weevil Control.**—*Jl. Econ. Ent.*, xix, no. 4, p. 607. Geneva, N.Y., August 1926.

In this paper, of which the abstract only is published, the method adopted for dusting cotton by means of aeroplanes [*R.A.E.*, A, xii, 164] is described in detail. An aeroplane adapted for this work carries a load of 500 lb. calcium arsenate, and is flown to and fro across the fields at a height of from 10 to 25 feet, so that the dust cloud will cover a strip of cotton from 200 to 250 feet wide, the aeroplane travelling at 100 miles an hour and dusting an acre of cotton in less than 2 seconds. One aeroplane can protect 5,000 acres of cotton through the season. Planters can co-operate in the use of such an aeroplane, which relieves them from disagreeable night work ; the aeroplanes can dust in daylight in spite of light breezes and can give prompt protection after heavy rains and to the rankest growth of cotton. The results of their use against the boll weevil [*Anthonomus grandis*, Boh.] have been very satisfactory, and they have also been successfully used in peach orchards against plum curculio [*Conotrachelus nenuphar*, Hbst.] and brown rot.

Hinds (W. E.). **The " Cloud Drift " versus the regular Method of Dusting.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 607–608. Geneva, N.Y., August 1926.

Only the abstract of this paper is published ; it describes briefly the method of dusting cotton known as the " cloud drift " as a remedy for the boll weevil [*Anthonomus grandis*, Boh.]. By this method part at least of the dust cloud is thrown relatively high in the air above the cotton plant, and then drifts slowly across the field, giving a fairly even distribution of poison over a number of rows beyond those covered directly by the dusting machine. The rate of dust discharged is increased so that the actual amount of poison applied to an acre is practically the same as by the usual methods of application. Experiments in Louisiana have shown that the gain of seed cotton to an acre due to regular dusting by the ordinary method was 501 lb., or 64 per cent. over the average untreated yield, while the gain due to the cloud drift method was 599 lb., or 77 per cent. The cloud drift method will, however, be limited in its usefulness by the narrow range of atmospheric conditions within which it can be applied, but when favourable conditions occur and the direction of the drift is across the rows, half the time required for the usual method of dust application can be saved.

Constitution and By-Laws of the Southern Plant Quarantine Board.—*Jl. Econ. Ent.*, xix, no. 4, pp. 609–610. Geneva, N.Y., August 1926.

The above are quoted verbatim, the object of the Board being to secure co-operation and uniformity of action as regards plant quarantine work in the various States concerned.

CHAMBERLIN (F. S.) & TENHET (J. N.). U.S. Bur. Ent. **The Seasonal History and Food Habits of the Tobacco Budworm,** *Heliothis virescens*, **Fab., in the Southern Tobacco Growing Region.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 611–614. Geneva, N.Y., August 1926.

This paper records studies supplementary to those previously noticed [*R.A.E.*, A, vi, 213] on *Heliothis virescens*, F. (tobacco budworm), which is one of the most important tobacco pests of the United States, particularly in the south-east. *H. obsoleta*, F. (false budworm), which is often thought to be the commonest species of budworm on tobacco in Florida, is comparatively rare, while *H. virescens* is extremely abundant each year, and has been recorded as far north as Connecticut. The first moths of *H. virescens* usually emerge in time to infest tobacco that is set out during the first part of April, eggs being sometimes deposited on the seed-beds during March. From that time until mid-October there are four generations, the first two confining themselves almost entirely to tobacco, while the third, which is mainly present in late July and August, feeds upon late tobacco and beggarweed (*Meibomia* sp.), with a decided preference for the latter. The fourth generation, present in September and early October, feeds almost entirely on beggarweed, though some tobacco suckers are usually present in the fields at that time ; this generation overwinters in the ground in the pupal stage. There may be a partial fifth generation in Florida, and a few scattered individuals may be present throughout the winter months. On tobacco, the feeding is mainly on the terminal buds, but when the seed-heads are formed the budworms congregate on them, apparently preferring them to other parts of the plant. There seems to be no preference for any particular type of tobacco. In spring and summer, when feeding on tobacco, the budworm larvae are green or yellow-green in colour, but later, and particularly when collected from beggarweed, they are darker. Food-plants of minor importance include okra [*Hibiscus esculentus*], tomato, cultivated sweet peas, on which, however, the larvae seem unable to mature, and (recorded from other regions) potato, cotton, chick-pea, ground cherry (*Physalis viscosa*), cultivated geranium, *Ageratum* and deer grass (*Rhexia virginica*). In experiments larvae also subsisted for some time on cowpeas and lucerne.

Nickels (C. B.) **An Important Outbreak of Insects infesting Soy Beans in Lower South Carolina.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 614–618. Geneva, N.Y., August 1926.

There was a severe outbreak of leaf-eating caterpillars on soy-beans [*Glycine hispida*] in southern South Carolina in the late summer and autumn of 1925, 95 per cent. of the damage being attributable to *Anticarsia gemmatalis*, Hb. (velvet-bean caterpillar) and *Heliothis obsoleta*, F. (corn-ear worm), minor pests being *Laphygma frugiperda*, S. & A. (fall army worm), *Goniurus proteus*, L. (grass worm) and *Prodenia* sp. *A. gemmatalis* is a serious pest of velvet beans [*Stizolobium*] in Florida, but had not been recorded as causing much injury to soy-beans until 1925. Tests for its control were made with poisons in the laboratory and in the field. It was found that any less concentration than 1 part calcium arsenate to 4 parts lime is not highly toxic, while anything stronger than this is unsafe for application on soy-beans. Larvae less than ¾ in. long are readily killed by the above strength, but larger ones are very difficult to kill. Lead arsenate dust, even when diluted with 4 parts of lime, proved injurious to the plants, but 2 lb. lead arsenate to 50 U.S. gals. water produced no injury. The poisons found injurious might, however, be safe under certain weather conditions; the degree of maturity of the plants also influences the extent of scorching that occurs; the plants used in these tests were nearly mature. It is considered unlikely that *A. gemmatalis* will survive the winter in South Carolina; hence outbreaks are only likely to occur when conditions are favourable for the multiplication of the insect in southern Florida, with favourable winds to carry a large number of moths into South Carolina in time to damage the plants.

H. obsoleta will probably be an important pest in 1926, for large numbers pupated in the autumn of 1925.

Hamlin (J. C.) & Reed (W. D.). U.S. Bur. Ent. **Metal Barriers as Protective Devices against the Saw-toothed Grain Beetle.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 618–624, 1 pl. Geneva, N.Y., August 1926.

The arc and angle barriers of sheet-iron used in the control of *Silvanus* (*Oryzaephilus*) *surinamensis*, L. (saw-toothed grain beetle) [*R.A.E.*, A, xiv, 76] are described in detail and illustrated. General observations on the reactions of the beetles to these barriers are described and the experimental data are summarised in tables; these show that 0·8 per cent. and 0·76 per cent. of the approximate total number of beetles attempting to climb the barriers reached raisins protected by the angle and arc barriers respectively. It is probable, however, that an error occurred in one of the series of experiments with the angle barrier, and that the latter is in fact the more effective of the two.

Balduf (W. V.). **The Acalypha Flea Beetle** (*Crepidodera atriventris*, **Melsh.**).—*Jl. Econ. Ent.*, xix, no. 4, pp. 624–632, 8 refs. Geneva, N.Y., August 1926.

An account is given of the flea-beetle, *Crepidodera atriventris*, Melsh., with notes on its life-history, food-plants and distribution in the United States [*R.A.E.*, A, xiii, 124]. In Illinois, there are apparently two generations in a year, the winter being passed in the adult stage. The first generation occupies roughly the period from May to end of August, the eggs being found from 23rd May to 10th July, larvae from 2nd June to 25th July, pupae from 16th June to 5th August, and adults from 26th June to 30th August. The eggs of the second generation may be found from 1st July to September, the first adults occurring on 10th August, so that the two generations overlap considerably. During June and July the total life-cycle requires only 5 weeks. Apparently the insects can develop as well on various ornamental species of *Acalypha* as on the wild *A. virginica,* and it is unlikely that yearly migrations from the wild to the cultivated kind occur. A Hymenopterous parasite has been found to emerge in the larval stage from adults of *C. atriventris,* and it is possible that this may be *Perilitus epitricis,* Vier., which has been reared from other flea-beetles [*R.A.E.*, A, iii, 547].

Douglass (J. R.). U.S. Bur. Ent. **The Squash Beetle in Arizona. Occurrence and Probable Manner of Introduction.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 632–635. Geneva, N.Y., August 1926.

A variety of *Epilachna borealis,* F. (squash beetle), which is apparently a Mexican form, appeared in 1921 in Arizona, and increased until it infested an area of 65 sq. miles, attacking a number of cucurbits but chiefly squash and cantaloup. Both adults and larvae feed on the leaves, skeletonising a small area near the margin, and also attack the blossoms. There seems to be only one generation in Arizona, as the overwintering adults did not appear till July. Larvae were common at the beginning of August, pupation occurring later in the month. Newly emerged beetles began to appear at the end of August, and were numerous in September, but no eggs were observed at this time. During 1925, the insect was not found within the previously infested area, and a study of meteorological records leads to the conclusion that a deficiency in precipitation, combined with an increase in the mean temperature during hibernation, may have caused its disappearance.

Campbell (R. E.). U.S. Bur. Ent. **The Concentration of Wireworms by Baits before Soil Fumigation with Calcium Cyanide.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 636–642. Geneva, N.Y., August 1926.

Further tests with calcium cyanide as a soil fumigant for wireworms [*R.A.E.*, A, xii, 581] have shown that applications of 200 to 300 lb. of granular calcium cyanide (with cyanide content equivalent to from 40 to 50 per cent. of sodium cyanide) to an acre, made with a grain drill at a time when the wireworms can be reached by this method, kills a large percentage of them. As, however, it is an expensive process, several kinds of seeds, such as beans, peas and maize, were planted as baits in rows. A fairly heavy dose of poison was then applied to the baited rows on which the wireworms had concentrated (5 to 5½ lb. to 1,000 feet of row proved the most satisfactory amount, if both lethal effect and cost were considered), and by this means rather less than 100 lb. of the cyanide an acre was required with rows 2½ feet apart. An average mortality of 91 per cent. was obtained in this way. The number of wireworms attracted to the baits decreased as the width of the rows increased, being on the average 96 per cent. for 2 feet rows and 80 per cent. for 4 feet rows.

OSBURN (M. R.). **Comparative Tests with Sodium Fluosilicate and Calcium Arsenate for the Control of the Cotton Boll Weevil** (*Anthonomus grandis*).—*Jl. Econ. Ent.*, xix, no. 4, pp. 643–644. Geneva, N.Y., August 1926.

In these tests against *Anthonomus grandis*, Boh. (cotton boll weevil), equal field plots of cotton were treated with 5 lb. an acre of calcium arsenate, and with 10 lb. an acre of sodium fluosilicate, which is heavier, other plots being left untreated. In cage tests, the sodium fluosilicate apparently acted as a repellent as well as an insecticide, as weevils tended to collect on the side of the cage after dusting. Actual feeding was not necessary to produce killing, for weevils getting the poison on their feet brushed it off on the mouth-parts, and when placed on poisoned leaves, they died within a few hours without having fed on them. Tables, recording the results of field and cage tests, show that under the conditions of these experiments, sodium fluosilicate was more effective than calcium arsenate, and became effective in less than half the time. An average control of 80 per cent. was attained in 24 hours, while 48 hours were necessary for a mortality of 69 per cent. with calcium arsenate. The rapidity of effect is an important factor in rainy weather, as it may obviate the necessity of redusting almost immediately. There was very slight evidence of scorching on the more tender foliage, but not enough to make any attempt to dilute the sodium fluosilicate worth while.

BAKER (A. C.). U.S. Bur. Ent. **Survival Expectancies of Two Aphids.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 648–650, 1 fig. Geneva, N.Y., August 1926.

Two common types of Aphids were chosen for this study, namely, *Aphis pomi*, DeG., which is always present in fair abundance, and *Toxoptera graminum*, Rond., which produces outbreaks of considerable magnitude. From the graph drawn up as a result of the study it is apparent that the expectancy of survival of *T. graminum* is, on the basis of these records, considerably greater than that of *A. pomi*. If this were a constant difference, it might have some bearing on the relative ability of the species to increase.

DOUCETTE (C. F.) U.S. Bur. Ent., & SMITH (F. F.). **Control Experiments on the Surinam Cockroach** (*Pycnoscelus surinamensis*, **L.**).—*Jl. Econ. Ent.*, xix, no. 4, pp. 650–656, 5 refs. Geneva, N.Y., August 1926.

Pycnoscelus surinamensis, L., a tropical cockroach, has recently been very injurious in a number of greenhouses in the eastern United States, and efforts to control it are described. The cockroaches are active at night and hide in the soil by day. A list of substances that proved attractive in traps is given, showing their relative value in this respect. Sugar syrup and butyric acid in combination appeared the most attractive. As dextrin paste, used for labelling, was eagerly devoured, a number of poisons were mixed with this and used as baits. Many gave no kill ; Paris green was lightly eaten and gave 10 to 55 per cent. mortality ; lead arsenate and calcium phenyl arsenate were eaten moderately and gave 45 to 80 and 60 to 80 per cent. mortality respectively. Of the substances readily eaten, borax killed 20 to 80 per cent., calcium arsenate 80 to 100 per cent., and diphenyl arsenious oxide 40 to 100 per cent. It is concluded that poison baits would not be satisfactory under commercial conditions.

In experiments with substances for treating the soil, carbon bisulphide emulsion and sodium fluoride or sodium fluosilicate used as dusts on the surface proved valueless ; in pot experiments, 0·1 gm. sodium cyanide or 1 gm. phenol crystals dissolved in 100 cc. water and applied to about 400 gms. of soil gave 100 per cent. mortality after 24 hours. Sodium cyanide at a strength of 0·05 gm. in 100 cc. water killed immature individuals only. When applied to plants in greenhouse beds, the phenol was not satisfactory, even at the rate of 8·5 gms. per plant. Sodium cyanide usually killed over 90 per cent. of the insects when applied at the rate of from 1 to 2·5 gms., 100 per cent. mortality being obtained in some cases. Mature roses were uninjured by this treatment, but those treated six weeks after planting showed injury in some cases. Kerosene, poured along the edges of the beds, was effective in killing all cockroaches that it touched.

PARK (O. W.). **Water-carriers versus Nectar-carriers.**—*Jl. Econ. Ent.* xix, no. 4, pp. 656–664, 5 figs., 8 refs. Geneva, N.Y., August 1926.

A method of distinguishing water-carrying bees from nectar-carriers is described.

VAN ZWALUWENBURG (R. H.). **Insect Enemies of Sugarcane in western Mexico.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 664–669. Geneva, N.Y., August 1926.

The most serious pests of sugar-cane in the State of Sinaloa, western Mexico, are the Pyralid moth-borers, *Chilo loftini*, Dyar, and *Diatraea lineolata*, Wlk., the former being the more important, as it breeds throughout the year and is almost unaffected by parasites. It requires about 60 days for a complete generation. The eggs are deposited singly or in clusters, generally between the leaf-sheath and stalk. The young larvae feed within the stalk just under the rind. Pupation occurs in a loose cocoon after an exit from the gallery has been cut to the outside. Ratoon and plant cane both suffer, sometimes 85 per cent. of the stalks being infested, and the moth has also been bred from maize, rice, *Sorghum* and practically all grasses with stalks large enough to afford it shelter. There are three Hymenopterous parasites in Mexico. The Braconid, *Chelonus sonorensis*, Cam., which lays its eggs in those of the host, the larva emerging from the host larva, is effective when rice is infested, but is apparently useless in cane, and is itself probably parasitised by a species of *Rhyssalus*. Minor parasites are the Ichneumonids, *Mesostenus* sp. and *Mallochia* sp.

Diatraea lineolata breeds also in maize, rice and certain large grasses. *D. grandiosella*, Dyar (in maize), and *D. canella*, Hamps., also occur in the region. *D. lineolata* is primarily a pest of plant cane. It passes the winter in the larval stage and pupates in the spring, there being not more than three, and possibly only two generations in the year. In late summer, six or seven weeks are required for one generation. The eggs are exposed on the leaf, singly or in small clusters, and hatch in from six to eight days. The young larvae feed on the epidermis of the leaf or tunnel in the midrib, eventually travelling down the stalk in a characteristic longitudinal tunnel, This species is heavily parasitised by *Trichogramma minutum*, Riley, which sometimes destroys as many as 70 per cent. Minor parasites are the Dexiid, *Phorostoma* sp., and *Apanteles diatraeae*, Mues. *Euzenilliopsis diatraeae*, Towns., and *Sarcophaga sternodontis*, Towns., were both introduced from Cuba in 1922, but neither has been recovered in the district studied ; in 1923 the Tachinid, *Paratheresia signifera*, Towns., from the State of Vera Cruz and *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., from New Orleans were also introduced and released.

Minor pests of sugar-cane are *Leptodictya tabida*, H.S. (sugar-cane lacewing), found also on maize and rarely on bamboo ; the Noctuid, *Saccharophagos mochisa*, Schaus, found in old ratoon fields, gnawing a rough cavity at the base of the stalk ; the mealybugs, *Pseudococcus boninsis*, Kuw., and *Trionymus sacchari*, Ckll., which are uncommon on the west coast ; the Chrysomelid, *Diabrotica fenestralis*, Jac., which sometimes injures young cane at the margins of fields, its favourite food being *Amarantus* ; *Cirphis latiuscula*, H.–S., and *C. cholica*, Dyar, on old ratoons, parasitised by *Apanteles militaris*, Say, and the Tachinids, *Archytas cirphisae*, Curran, and *Spallanzania hesperidarum*, Will. ; the Homoptera, *Acanalonia bivittata*, Say, *Stictocephala festina* var. *rufivitta*, Wlk., *Draeculacephala mollipes*, Say, and *Tomaspis postica*, Wlk. ; and *Blissus leucopterus*, Say, which, however, is only rarely found.

Sugar-cane insects in Eastern Mexico include two species of *Diatraea* ; *Xubida dentilineatella*, B. & McD. (a small moth-borer spinning a cocoon within the cane) parasitised by the Tachinid, *Masicera tantilla*, Wulp ; and *Sphenophorus incurrens*, Gyll., which causes occasional outbreaks in old fields, but is parasitised by *Myiophasia metallica*, Towns.

GILLETTE (C. P.). **Apple Curculio.**—*Jl. Econ. Ent.*, xix, no. 4, p. 670. Geneva, N.Y., August 1926.

An abnormal outbreak of *Tachypterellus quadrigibbus* (apple curculio) is reported in a cherry orchard in Colorado. At least 98 per cent. of the cherries were attacked, apples in the vicinity also being injured.

LANGFORD (G. S.). **The Possibilities of Sodium Fluosilicate as a Poison in Grasshopper Baits.**—*Jl. Econ. Ent.*, xix, no. 4, p. 670. Geneva, N.Y., August 1926.

In laboratory experiments to test the effectiveness of sodium fluosilicate as a poison in grasshopper bait, using chiefly *Melanoplus femur-rubrum*, DeG., for the tests, very good results were obtained, this substance ranking above Paris green, white arsenic, sodium arsenite and sodium fluoride used in the same way and under the same conditions, both in degree of toxicity and in the time required for killing. After 4 days, 100 per cent. of the grasshoppers were killed by it, the other poisons mentioned giving only from 92 to 98 per cent. toxicity in the same time. The baits were all made according to the standard formula, the sodium fluoride and sodium fluosilicate being used at the rate of 4 lb. to each 100 lb. bran.

ANDREW (R. E.) & GARMAN (P.). **Effect of the Order of mixing various Spray Ingredients, on the Formation of Injurious Compounds.**—*Jl. Econ. Ent.*, xix, no. 4, p. 671. Geneva, N.Y., August 1926.

A table shows the effects of different orders of mixing lead arsenate, nicotine sulphate, casein-lime and lime-sulphur. With these 4 ingredients, 24 different combinations are possible, all of which have been made and analysed in the laboratory. Some variation in soluble arsenic and sulphur are indicated, but the variations are generally so small that definite conclusions cannot be drawn regarding their importance. There are strong indications of the formation of colloidal sulphur in some combinations, which appears in the filtrates as a decided turbidity. Pure lime or casein-lime, in amounts used in the more common formulae, seem undoubtedly to decrease the amount of soluble arsenic formed in the spray mixture, but there is also danger of decreasing the sulphur in certain combinations. This reduction in sulphur would probably decrease the value of the mixture considerably. More complete results are to be published later.

VAN DINE (D. L.). **The Sugar Cane Moth Stalkborer.**—*Trop. Plant Res. Foundation*, Bull. 2, 11 pp. Washington, D.C., 16th July 1926.

A general account is given of the bionomics and control of *Diatraea saccharalis*, F., which is a serious factor in limiting the production of sugar-cane and the yield of sugar from it in Cuba [*R.A.E.*, A, xiv, 498]. Though the Tachinid, *Euzenilliopsis diatraeae*, Towns., is a useful parasite, its activities are not sufficient to hold the pest in check. Other parasites occurring in Cuba are the egg-parasite, *Trichogramma minutum*, Riley, the efficiency of which is decreased by burning off the cane; *Sarcophaga sternodontis*, Towns., bred from the pupa; and *Apanteles diatraeae*, Mues., and *Bassus stigmaterus*, Cress., parasitic on the larvae.

Other borers of sugar-cane occurring in Cuba, but of less importance than the above, are *D. lineolata*, Wlk., *Metamasius sericeus*, Oliv., a small moth of the subfamily PHYCITINAE, and *Xyleborus perforans*, Woll.

ILLINGWORTH (J. F.). **The Genus *Popillia* with its Natural Enemies in the Orient (Col.).**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 256–259, 7 refs. Honolulu, July 1926.

This is a brief review of the work of the United States Department of Agriculture in investigating natural enemies of *Popillia japonica*, Newm., and allied species in Japan, Korea and China [*cf. R.A.E.*, A, xii, 172]. The author observed the habits of the Tachinid, *Ochromeigenia ormioides*, Towns., in Yokohama; the flies rest motionless during the day and become active at dusk; they are larviparous and attack the beetles on the back, possibly depositing their larvae beneath the elytra. In China, in the valley of the Yangtze, four species of *Popillia* were found, *P. atrocoerulea*, Bates, *P. indigonacea*, Mot., *P. cyanea*, Hope, and *P. quadriguttata*, F.; many thousands of these beetles were collected, but the only parasites obtained from them were two specimens of *O. ormioides*. Further south, at Foochow, *P. cyanea* and *P. quadriguttata* were very abundant, and *P. marginicollis*, Hope, also occurred, but no parasites of the adults were found. Scoliids attacking the larvae of *Popillia* are often observed in China, and two species of the genus *Tiphia* have been sent to the United States.

MORITA (H.). **Some Observations on the "Silverfish" (*Lepisma saccharina* L.) (Thys.).**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 271–273. Honolulu, July 1926.

Lepisma saccharina, L. (silverfish) is almost cosmopolitan in distribution, occurring commonly in North America, Europe, China, Japan, and the Hawaiian Islands. It is found in books and papers in dark places, feeding on paste and glue in bindings, behind wall-paper, in clothing and fabrics containing starch, and infesting dry starchy foods and other materials; it always avoids light, but does not appear to react to sounds. Starch is one of its principal foods, but glue and various animal substances are also eaten, and glazed paper that had been treated with glue in manufacture was preferred to starch. The insects also feed on living or dead individuals of their own species. Adults were placed in glass jars with glazed paper as food, and kept in the dark; after five weeks eggs were observed on the paper in one of the jars. Each female usually laid from seven to twelve eggs, which hatched in six to ten days. The young resemble the adults; they moult six or seven times, complete development from egg to adult occupying seven to nine months. Multiplication would thus appear to be slow, but over 80 per cent. of the eggs laid produce adults.

FULLAWAY (D. T.). **A New Species of Fruit-fly Parasite from Formosa (Braconidae).**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 283–284. Honolulu, July 1926.

Biosteres formosanus, sp. n., is described from specimens bred from pupae of *Dacus* sp., infesting a wild fruit in Formosa.

SWEZEY (O. H.). ***Arrhenophagus albipes* Girault in Hawaii (Hym.).**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 294–295, 3 refs. Honolulu, July 1926.

The Encyrtid, *Arrhenophagus albipes*, Gir., originally described from China and Japan, is a common parasite of *Phenacaspis eugeniae*, Mask., on oleander in the Hawaiian Islands, into which it was probably introduced by Koebele. The parasitised scales are mainly young females about half grown, but male scales are also attacked; on one occasion, 309 parasitised scales were counted on a single leaf, and on another, 53 parasites on one leaf.

SWEZEY (O. H.). ***Casinaria infesta* (Cress.) in Hawaii (Hym.).**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 296–297. Honolulu, July 1926.

The Ichneumonid, *Casinaria infesta*, Cress., was first noticed in the Hawaiian Islands in 1921; since that time the author has bred it from *Hymenia recurvalis*, F., on amaranth, and from eight other species of leaf-rolling Pyralids, which are listed with their food-plants; with the exception of *H. recurvalis* all the hosts are uncommon. The host larva completes its growth and makes a cocoon, usually by spinning leaves together, before it is killed by the parasite ; the parasite larva spins a cocoon inside that of the host, and the adult emerges about 7–10 days later. It is hoped that it will attack the related leaf-roller, *Nacoleia* (*Omiodes*) *blackburni*, Butl., which is a pest of coconut leaves, but it has not yet been recorded from the latter. *C. infesta* occurs in various parts of the United States and probably reached Hawaii as a natural immigrant.

TIMBERLAKE (P. H.). **New Species of Hawaiian Chalcid-flies (Hymenoptera).**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 305–320, 1 pl. Honolulu, July 1926.

The Chalcidoid parasites from Hawaii dealt with include *Bruchobius vagabundus*, sp. n., bred from a mixed infestation of *Bruchus* (*Mylabris*) *quadrimaculatus*, F., and *B.* (*M.*) *chinensis*, L., in pigeon peas [*Cajanus indicus*] (also from *Bruchus* (*Mylabris*) sp. at Bangalore, India) ; *Pachyneuron eros*, Gir., redescribed from specimens bred from puparia of *Leucopis* spp. and Coccid material in which *Leucopis* was probably present (also from the United States) ; *Prospaltella bicolor*, sp. n., from *Aspidiotus cydoniae*, Comst., and other Coccids ; *P. transvena*, sp. n., from *Trialeurodes* (*Asterochiton*) *vaporariorum*, Westw., and other Aleurodids and from *Aphis sacchari*, Zehnt. ; *Coccophagus hawaiiensis*, sp. n., from *Saissetia nigra*, Nietn., a table to distinguish it from *C. japonicus*, Compere, and *C. lecanii*, Fitch, being given ; and the Eulophid, *Melittobiopsis ereunetiphila*, gen. et sp. n., from *Ereunetis flavistriata*, Wlsm., on sugar-cane and coconut. *Aphycus terryi*, Full., which the author made the type of his genus *Pseudococcobius* [*R.A.E.*, A, iv, 366], has been shown by Mercet to be a true *Aphycus*, making *Pseudococcobius* fall as a synonym.

ILLINGWORTH (J. F.). **A Study of Ants in their Relation to the Growing of Pineapples in Hawaii.**—*Expt. Sta. Assoc. Hawaiian Pineapple Canners*, Bull. 7, 16 pp., 8 refs. [Honolulu] July 1926.

It has been generally believed that ants cause considerable damage in the Hawaiian pineapple fields, mainly by attacking the roots of the plants and disseminating disease.

The 13 species of ants occurring in Hawaii are dealt with in the order of their abundance, with notes on their bionomics. The most important is *Pheidole megacephala*, F., and its predominance is mainly due to the fact that it is extremely intolerant of other ants of similar size. The only injury to the root-system discovered was the arrested growth of the root-tip, due to the continuous movement of the ants over it. The surface gradually turns brown and no root-hairs are thrown out from the affected parts ; the condition is, however, so infrequent that it has little effect upon the growth of the plant.

Ants do not appear capable of causing the dissemination of bacteria and fungi that infest the roots of pineapple, spores of which are constantly present in the soil, as they do not cause any injury to the roots that would admit of the entrance of the organisms ; moreover, they destroy numerous small insects, etc., that do injure the roots.

The connection of ants with mealybugs is also rather beneficial than otherwise ; they do not assist in the transportation of these Coccids from place to place, and the fact that they feed on the sweet secretions prevents the development of black smut on the fruit. In any case the presence of mealybugs is far less important than that of many other pests that are destroyed by ants in the pineapple fields; these are Nematodes, in search of which ants will even open galls; root maggots such as the larvae of *Sciara* spp.; larvae and adults of *Carpophilus* beetles, one of the major pests in Hawaii; larvae of bud moths, especially *Ereunetis flavistriata*, Walsm.; the root grubs, *Adoretus sinicus*, Burm., *Gonocephalum seriatum*, Boisd., *Pantomorus godmani*, Crotch, and *Monocrepidius exul*, Sharp; and the fruit maggots, *Euxesta annonae*, F., *Chrysomyza aenea*, F., *Atherigona excisa*, Wied., and *Drosophila repleta*, Woll.

The tunnels made by the ants near the roots greatly assist in drainage, as the water running down them quickly reaches even the deepest portions of the roots, and a much heavier rainfall would be needed to penetrate to the same depth without them.

HINDS (W. E.). **Aparato de mano para aplicación en polvo del arseniato.** [A Hand Apparatus for applying Arsenate Dust.]—*La Vida agricola*, iii, no. 28, pp. 283–289, 5 figs. Lima, April 1926. [Recd. September 1926.]

The duster described is made from a piece of wood, 6 ft. long, shaped like a double-bladed paddle. Each blade forms the top of a box, made by nailing a fabric on the edges of the blade, and on a frame-work fixed to it. A hole in the blade permits the box to be filled with a dust insecticide. In use the operator walks between the rows of plants, holding the apparatus horizontally so that the dust is shaken through the fabric on to the rows on either side of him. This device is used in Peru against cotton pests such as *Alabama argillacea* and *Anomis* (*Aletia*) *luridula*.

TAFUR (O. B. G.). **El Departamento de Lambayeque y el cultivo del algodón.** [The Department of Lambayeque and the Cultivation of Cotton.]—*La Vida agricola*, iii, no. 28, pp. 291–300, 2 figs. Lima, April 1926. [Recd. September 1926.]

In Peru the cultivation of cotton has never succeeded in some districts owing to the presence of a weevil [*Anthonomus vestitus*, Boh.], which is active in spring and summer. It is therefore suggested that as the minimum winter temperature in that region is 18° C. [64·4° F.], cotton should be sown early in that season, so that by the spring the bolls will be so advanced as to be no longer subject to attack.

TOWNSEND (C. H. T.). **Informe sobre la región algodonera de Iquitos.** [Report on the Cotton Region of Iquitos.]—*La Vida agricola*, iii, no. 28, pp. 303–312. Lima, April 1926. [Recd. September 1926.]

The insect pests of cotton recorded include the cotton-stainer, *Dysdercus ruficollis*; a new weevil of the genus *Eulechriops*, which oviposits in the bark at or below ground level, the boring of the larvae into the stem causing the plant to rot and die, and which may be combated by uprooting and burning infested plants; *Anthonomus vestitus*, which attacks the squares and may be combated by dusting with calcium arsenate or spraying with a solution containing white arsenic and molasses; various cutworms, against which a bait of bran and Paris green sweetened with molasses is advocated; the caterpillars of *Alabama argillacea*, for which an arsenical spray is suitable; a mite, *Eriophyes* sp., the attack of which can be avoided by planting either an early maturing variety of cotton or one with pubescent leaves such as Egyptian Upland; and the Coccids, *Asterolecanium pustulans*, *Pinnaspis* (*Hemichionaspis*) *minor*, *Saissetia nigra* and *Pulvinaria* sp. These may be prevented from doing much harm by planting an early maturing variety; and, if necessary, the plants should be burnt after the crop has been gathered.

CLEARE, Jr. (L. D.). **Report on the Working of the Biological Division.**—[*British Guiana*:] *Repts. Dept. Sci. & Agric., 1925*, Appx. v, 4 pp. [Demerara] 1926.

The situation with regard to *Diatraea saccharalis*, F., and *D. canella*, Hmps., on sugar-cane is discussed, and the measures employed against these moths are recapitulated [*R.A.E.*, A, xi, 113; xiv, 101]. The former has been known to occur on rice in the Colony for some years, and its effect on this crop is to be investigated. *Castnia daedalus*, Cram., boring in coconut palms, is apparently more prevalent than has been supposed and is to be further studied.

FREEMAN (W. G.). **Plant Pathology.**—*Rept. Dept. Agric. Trinidad & Tobago 1925*, pp. 31–34. Trinidad, 1926.

The pests recorded are largely the same as those mentioned in the previous report [*R.A.E.*, A, xiii, 493]. In the campaign against parasol ants [*Atta*] carbon bisulphide was found to be much more successful than calcium cyanide, though the latter is useful for small nests such as occur in gardens. Calcium cyanide was also used successfully in the dry season, when carbon bisulphide was ineffective owing to the cracks in the ground. The outstanding feature of the year was an outbreak of sugar-cane froghopper [*Tomaspis saccharina*]. The coconut Nematode [*Aphelenchus cocophilus*] infested both oil palms [*Elaeis guineensis*] and date palms in the Botanic Gardens; this is the first record of its appearance on palms not of the genus *Cocos*.

WITHYCOMBE (C. L.). **The Sugar Cane Froghopper.**—*Proc. Agric. Soc. Trinidad & Tobago*, xxvi, no. 6, pp. 294-301. Trinidad, 1926.

In Trinidad the froghopper, *Tomaspis* (*Monecphora*) *saccharina*, originally lived on grasslands, wherever conditions were moist enough for its development. When sugar-cane, which is simply a large grass, began to be cultivated, conditions in the canefields were ideal for the froghopper during the wet season. The dry season was, however, much more unfavourable to it in the exposed cane fields than under bush and forest, so that a biological race was developed, adapted to passing this season in the egg stage, which can survive several months of drought, instead of breeding more or less uniformly throughout the year, as the froghoppers in the valleys still do. The numbers of its natural enemies then began to fluctuate correspondingly. The two factors of humidity and natural enemies, however, must be considered also in their combined effect on the froghopper, for the more pronounced is the effect of the dry season, the longer will the natural enemies be deprived of food. Parasites, especially egg parasites, are not now common in the fields where the froghopper is a pest, but in the valleys, where the host occurs in smaller numbers throughout the year, parasites can be found at any time.

The water content of the canes is an important factor in their recovery from the effect of froghopper attack [*cf. R.A.E.*, A, xiv, 187]. The cane may suffer from water shortage not only in time of drought, but also when water is present but not physiologically available. In order that the roots may function properly, the soil must be well aerated. They cannot, therefore, function in heavy, badly cultivated soil, or even in well cultivated soil if it has become waterlogged, so that excess of water may have the same effect as drought. Consequently good agricultural methods are of the greatest importance in minimising the effect of froghopper attack. When artificial remedies must be used, insecticides in dust form are by far the most effective. Hand dusting is impossible after the canes have reached a height of 2 or 3 feet. Cart dusting machines will treat about 30 acres a day or night, but their work is limited by ground conditions, height of the cane, and spacing, as well as atmospheric conditions. Properly designed aeroplanes can do the work of 50 to 75 cart dusting machines, and can dust from 200 to 1,000 acres an hour. They are independent of ground conditions (unless very hilly) and almost independent of weather conditions, while the cost of operation is distinctly less.

Report of the Virgin Islands Agricultural Experiment Station, 1925.—17 pp., 4 figs. Washington, D.C., June 1926.

A type of maize has been developed that is no more susceptible to *Peregrinus* (*Dicranotropis*) *maidis* (corn leafhopper) and *Heliothis obsoleta* (corn ear-worm) than the local variety. As a result of fumigating all tubers of sweet potatoes with carbon bisulphide no infestation by *Euscepes batatae* occurred during the year. Cucumber growing was handicapped by severe attacks of *Aphis gossypii* and *Diaphania hyalinata*. *Platyedra* (*Pectinophora*) *gossypiella* (pink bollworm) and *Alabama argillacea* (cotton worm) were the most serious pests of cotton during the year. *P. gossypiella* may be controlled by thoroughly fumigating seed cotton and cottonseed, and by strictly adhering to a closed season when all fields, warehouses, etc., are thoroughly cleaned of seed and all wild cotton and allied plants are destroyed.

PERRY (W. M.). **Gardening in the Virgin Islands.**—*Virgin Is. Agric. Expt. Sta., St. Croix*, Bull. 6, 19 pp., 5 figs., 1 ref. Washington, D.C., May 1926. [Recd. September 1926.]

This bulletin includes instructions for the preparation of the usual insecticides; the insects concerned, however, are not dealt with in detail here, as they are the subject of a previous bulletin [*R.A.E.*, A, xi, 574].

BOX (H. E.). **Parasites of Sugar Cane Moth Borer** (*Diatraea*).—*Ref. Book, Sugar Indust. World*, reprint, 7 pp. New Orleans, La., July 1926.

An account is given of the species of *Diatraea* attacking sugar-cane in the Western Hemisphere, with a list of the known parasites. The introduction of parasites from other countries for the purpose of control is reviewed, and it is pointed out that in no instance has there been any direct failure to establish the imported parasite. It is suggested that much more might be accomplished in this direction if a central station with branch laboratories could be established under competent entomologists for the purpose of studying every phase of such parasites and their possibilities.

Beltran (E.). **Estado actual de nuestros conocimientos acerca del *Coccobacillus acridiorum* d'Hér., y valor probable de la bacteriologia en el combate contra la langosta.** [The present State of our Knowledge regarding *C. acridiorum* and the probable Value of Bacteriology in Work against Locusts.]—*Bol. Direc. Estudios biol.*, iii, no. 4, pp. 73–77. Mexico, July 1926.

A brief review of d'Hérelle's work against locusts with *Coccobacillus acridiorum* is given, together with a note on the views, favourable and unfavourable, regarding its value, the conclusion reached being that the question remains unsolved.

Jarvis (E.). **Cane Pest Combat and Control.**—*Queensland Agric. Jl.*, xxvi, pt. 1, pp. 47–50, 1 pl. Brisbane, 1st July 1926.

Experiments with benzine and calcium cyanide for the control of termites, *Eutermes vernoni*, Hill, and *Termes* sp., were very successful, and it is intended to test these substances against *Mastotermes darwiniensis*, Frogg.; in one case ½ pt. benzine was poured into a hole 6 in. deep in the top of a mound, which was then sealed up, resulting in the death of 95 per cent. of the termites including the queen in two days, and in another case 1 pt. benzine poured into a hole 2 ft. deep in a mound 5 ft. high killed all the termites within 10 days; two termite nests were treated with 2 oz. calcium cyanide each, placed at a depth of 2½ ft. in one and just inside the top of the other, in holes that were sealed with mud, and in each nest 95–97 per cent. of the termites were killed within 10 days.

In one area damage by *Rhabdocnemis obscura*, Boisd. (sugar-cane borer) has increased considerably, owing in some cases to large areas of infested sugar-cane being allowed to stand over, and in others to the destruction of its Tachinid parasite, *Ceromasia sphenophori*, Vill., by extensive fires; other factors that check the increase of *C. sphenophori* are a fungus, *Empusa* sp., and various predators, such as the ant, *Pheidole megacephala*, F., which is very common in most of the cane fields of North Queensland and probably attacks the adults as they emerge from their puparia.

Living adults of the Scoliid, *Triscolia rubiginosa*, F., including a single female, bred from larvae of *Xylotrupes gideon*, L., were received from Java, and it was hoped that the female might oviposit in the larvae of *Lepidoderma albohirtum*, Waterh., although this is unlikely as *T. rubiginosa* is a much larger insect than *Campsomeris tasmaniensis*, Sauss., or *C. radula*, F., which parasitise *L. albohirtum* in Queensland; it is probable, however, that *T. rubiginosa* will attack the larvae of *Xylotrupes australicus*, Thomp. (elephant beetle), and the latter species may serve as a host for breeding larger numbers of the parasite for experimental work.

Mungomery (R. W.). [**Report of the Southern Assistant Entomologist.**] —*Queensland Agric. Jl.*, xxvi, pt. 1, pp. 52–53. Brisbane, 1st July 1926.

During the drought that occurred in February and March larvae of *P*[*seudoholophylla*] *furfuracea*, Burm., penetrated deeper and deeper into the soil until they were below the level of the sugar-cane roots, with the result that the appearance of the canes that had been attacked by them improved. It was found that during the drought sugar-cane was much more susceptible to injury by paradichlorobenzene than in normal seasons, and plant cane under 2½ ft. high was injured by ⅛ oz. doses on each side of the stools, this amount even killing the plants in a few instances; larger plants and young ratoon cane were not affected, but it is evidently advisable to use paradichlorobenzene only when the moisture content of the soil is fairly high.

Jarvis (H.). **Sundry Notes on Injurious Insects of the Stanthorpe District.**—*Queensland Agric. Jl.*, xxvi, pt. 1, pp. 77–78, 1 pl. Brisbane, 1st July 1926.

An army-worm, *Cirphis unipuncta*, Haw., which attacks numerous garden and field crops in Queensland, has caused considerable damage to peaches and plums; the larvae burrow into the fruit, generally causing a rot to set in. A spray of 3 oz. Paris green, 2¼ oz. 40 per cent. nicotine sulphate, 12 oz. soap and 9–10 gals. water is very effective in controlling it and also the cabbage moth, *Plutella maculipennis*, Curt. (*cruciferarum*, Zell.) and the pumpkin beetle [*Aulacophora* sp.], which damages egg-plants and all kinds of cucurbits. A bait consisting of 1 qt. bran and 2–3 oz. Paris green or lead arsenate, mixed dry, has been found to control *C. unipuncta* satisfactorily when dusted round young tomato plants. The larvae of two other Noctuids, *Heliothis obsoleta*, F., attacking cabbages and young tomato plants, and *Agrotis* sp. attacking tomato fruit, have been prevalent.

A weevil, *Chrysolophus spectabilis*, F. (diamond beetle) has been found girdling the young stems of grape vines so that they break off easily; it is unlikely, however, that this species will become a pest of economic importance.

Young French beans have been damaged by the larvae of an Anthomyiid fly, which bore into the succulent roots, finally hollowing them out and killing the plants; the larvae pupate in the soil beneath the bean plants, and it is probable that the eggs are laid just below the surface of the soil.

Larvae of a Tenebrionid, *Pterohelaeus piceus*, Kby., were found attacking the roots of tomato plants, but this is probably not a normal occurrence.

Levick (G. T.). **The Horn-tails. A Timber Pest.**—*Jl. Dept. Agric. Victoria*, xxiv, pt. 7, pp. 436–438, 2 figs. Melbourne, July 1926.

For some years occasional specimens of Siricid wasps have been brought into Victoria in imported timber, and recently considerable numbers have been introduced in this way; there is no evidence of their having become established in the State, but in view of the possible danger of this occurring, all timber showing evidence of the presence of the larvae is either treated or burnt by the quarantine authorities The appearance and life-history of these Hymenoptera are briefl described.

Gurney (W. B.) & Le Gay Brereton (W.). **The Control of Wooll Aphis. Methods that are available.**—*Agric. Gaz. N.S.W.* xxxvii, pt. 7, pp. 545–551, 5 figs. Sydney, July 1926.

In parts of Australia where the climate is hot and dry, *Eriosom lanigerum*, Hausm. (woolly apple aphis) gives little or no trouble i normal seasons, but in regions where the summer is milder and moiste frequent spraying is necessary to keep it in check. As soon as th foliage begins to get thin in the autumn, the trees should be sprayed wit a contact insecticide such as tobacco wash, applied as a drenching spra at a pressure of not under 200 lb. One grower reports great success i the last two years with an autumn spray of 2 lb. caustic soda, ¾ pint 4 per cent. nicotine sulphate and 100 gals. water. The amount o caustic soda might be halved in the second year, as its cumulativ effect has not yet been determined. In late winter or early spring, mist spray of miscible oil using 1 gal. to 20 or 25 gals. water is recommended. This should be delayed as long as possible in order that th effects may be lasting, but should be applied before the trees are pas the early signs of buds or spurs swelling. If San José scale [*Aspidiotu perniciosus*, Comst.] or mussel scale [*Lepidosaphes ulmi*, L.] are present the oil spray will also help against them ; the water should be reduce by 20 per cent. for the latter. In New South Wales it has been foun that when early fungicide treatments are necessary, and the oil treatment is not required for other pests, it can be dispensed with, an tobacco wash or nicotine combined with the fungicide. Very goo results have been obtained by combining winter strength lime-sulphu and tobacco wash or commercial nicotine extract, applied when th buds were swelling. In Victoria, a combination of 1 gal. oil and 1 pin 40 per cent. nicotine sulphate to 80 gals. water gave great success as winter spray against *E. lanigerum*. In New South Wales, one season' test did not give such good results.

As summer advances, the Aphid multiplies rapidly and requires contact insecticide that is not injurious to the fruit and foliage, such a tobacco extract. Tobacco wash prepared without soda, and many o the commercial extracts, may be safely combined with lead arsenat and can be used against both woolly aphis and codling moth [*Cydi pomonella*, L.]. Nicotine sulphate (40 per cent.) is generally diluted t 1 pint to 100 gals. of water for *E. lanigerum*. The addition of miscibl oil, using 2, 3, or 4 pints to 100 gals. of tobacco spray, increases it efficiency. These quantities have, however, been tested for one seaso only, and it is possible that 4 pints may prove injurious to apple foliag or fruit. Fumigation was tried, but was found to have only a temporar effect and was too expensive. As *E. lanigerum* first re-appears i healing wounds on the trees, these should be kept very carefully painte with a thick, slow-drying oil. This, of course, can only be done on a limited number of comparatively small trees.

The best types of nozzle are discussed, and the successful establishment of the parasite, *Aphelinus mali*, Hald., is described. Arsenica sprays do not affect the parasite, and contact sprays have little direc effect on it, but when it has been introduced on one or two trees in a orchard, these trees should be left unsprayed, leaving sufficient Aphid for the rapid increase of the parasite. Prunings of trees showing dead parasitised Aphids should be kept to start fresh colonies of the parasite in the spring.

GURNEY (W. B.). **The Woolly Aphis Parasite** (*Aphelinus mali*, **Hald.**).—*Agric. Gaz. N.S.W.*, xxxvii, no. 8, pp. 620-626, 3 figs., 5 refs. Sydney, 1st August 1926.

This is a general account of *Aphelinus mali*, Hald., the parasite of *Eriosoma lanigerum*, Hausm., and of its introduction from New Zealand into Australia. The method used in the initial liberation of the parasites is explained, and the life-history is discussed [*R.A.E.*, A, xiii, 177, etc.].

SMIT (B. J.) & NAUDE (T. J.). **Fumigation with Hydrocyanic Acid Gas. Concentration and Distribution as influenced by Fumigation Procedure.**—*Union S. Africa Dept. Agric.*, Sci. Bull. no. 48 (Div. Chem. no. 66), 23 pp., 1 fig. Pretoria, 1926.

Experiments are described to determine the behaviour of hydrocyanic acid gas under the various conditions attending practical fumigation (particularly of *Citrus*). The experiments were conducted in a brick building with plastered walls and concrete floor and ceiling. It was found that with the pot method the generated gas rises rapidly to the highest part of the chamber and descends along the sides to the floor. During this process, every part of the chamber receives a wave of gas stronger than that of the theoretical concentration, but in about 10 minutes after charging, the distribution becomes uniform throughout the chamber.

When liquid hydrocyanic acid is used and is allowed to evaporate in the fumigation chamber without the application of heat, the area and nature of the surface on which the liquid is poured has an important effect on the rate at which the gas spreads throughout the chamber. The best results are obtained when the liquid is poured on the cement floor. In 20 minutes time, the concentration of the gas at most points of the chamber is nearly as high as the concentration after the same period when fumigation is carried out by the pot method. When the liquid is poured into a porcelain dish giving an evaporating surface of 124 square inches, it requires 60 minutes for a uniform concentration to be reached. When it is poured on air-dried soil on the floor of the chamber the concentration increases very slowly and even after an hour is only about half that obtained by the other methods.

Liquid hydrocyanic acid poured on to a hot pan gives a concentration of gas equal in rapidity, uniformity and concentration to that obtained by the pot method.

BECKLEY (V. A.). **Mealy Bug Destruction.**—*Kenya: Ann. Rept. Dept. Agric. 1925*, pp. 128–129. Nairobi [1926].

As the result of investigations of sprays for the control of the coffee mealybug [*Pseudococcus citri*, Risso], an emulsion of castor oil soap and solar oil (a petroleum distillate heavier than kerosene) was found to control an infestation although it does not eliminate it [*R.A.E.*, A, xiii, 523]. The napthalene and lime mixture [*loc. cit.*] placed round the bases of coffee trees infested with *P. citri* to repel ants [*Pheidole* *punctulata*, Mayr] was unsatisfactory, as dew or rain hardened the surface so that the ants could cross it, and other methods were tested. The constituents of coal tar distillates more toxic to plants were removed by distillation, leaving a mixture of aromatic substances boiling at a temperature above 300° C. [572° F.]; bands soaked in this fraction were entirely effective when put on the trunks of the coffee trees, and no ants crossed them in the course of two months.

ANDERSON (T. J.). **Report of Entomologist.**—*Kenya: Ann. Rept Dept. Agric. 1925*, pp. 133–140. Nairobi [1926].

The most important work of the year was that connected with the control of the coffee mealybug [*Pseudococcus citri*, Risso], which is reported on by T. W. Kirkpatrick. Further study of the insects predacious on this pest has shown that they include 13 species of Coccinellids, 3 Syrphids, 1 Agromyzid, 2 moths, 2 Chrysopids, at least 3 Hemerobiids, 1 Coniopterygid, and at least 6 Psocids. The most serious natural enemy of these beneficial insects is the ant, *Pheidole punctulata*, Mayr, which attacks most, if not all, of them in some stage of development; the mere presence of the ants, moreover, makes the mealybugs more prolific, probably mainly because they remove excreta and dead bodies. A poisoned bait was found that was sufficiently attractive to the ants to be carried by them to their nests, and sufficiently slow in its toxic action to allow the workers to feed the larvae with it before they themselves died, but as soon as a few of the individuals of a nest had been killed by it, the remainder would not touch it again. As the bait method was a failure, repellents were studied, and one was found that was both more efficient and cheaper than naphthalene [see preceding paper]; the use of this repellent has given ample proof that Coccinellids and other natural enemies of *P. citri* increase when protected from ants. Efforts that are being made to rear indigenous Coccinellids on an artificial food in order to have a constant supply for liberation when an outbreak of *P. citri* occurs are meeting with some success. An attempt was made to introduce the mealybug parasite, *Tanaomastix abnormis*, Gir., from Sicily, but no parasites emerged from the material at the time expected, so that the introduction has apparently been unsuccessful.

Minor pests of coffee were *Antestia lineaticollis*, Stål, *Thliptoceras octoguttale*, Feld. (coffee-berry moth), *Parasa vivida*, Wlk., and the Coccids, *Pseudococcus adonidum*, L. (*longispinus*, Targ.), *P. perniciosus*, Newst. & Willc., *Asterolecanium coffeae*, Newst., *Ceroplastes ceriferus*, And., *Pulvinaria psidii*, Mask., and *Cerococcus hibisci*, Green, which has not been previously recorded on coffee and is new to Africa, having been probably introduced on ornamental plants. The following Pentatomids have been found on coffee: *Plataspis flavosparsa*, Montr., *P. galerucoides*, Wlk., *Steganocerus multipunctatus* var. *argus*, F., *Cryptacrus comes* var. *pinguis*, Germ., *Callidea bohemani*, Stål, and *Caura rufiventris*, Germ.

LE POER TRENCH (A. D.). **Report of Senior Coffee Officer.**—*Kenya: Ann. Rept. Dept. Agric. 1925*, pp. 153–159. Nairobi [1926].

The coffee mealybug [*Pseudococcus citri*, Risso], which is the most serious pest of coffee in Kenya, has spread in several districts to an alarming extent; evidence was obtained on the experimental plot that where ants are kept from the coffee trees, *P. citri* is kept under control by the indigenous Coccinellid, *Chilocorus* sp. An outbreak of a Lamiid, *Dirphya* sp., occurred on one plantation, and about 30 acres of coffee trees were stumped and burnt. About 30 acres of coffee were badly attacked by *Asterolecanium* [*coffeae*, Newst.], and it was intended to destroy the trees after the crop had been harvested, but in about 4 to 6 weeks the scale entirely disappeared. The damage to coffee caused by the waxy scale [*Ceroplastes ceriferus*, And.], *Ischnaspis longirostris*, Sign., *Pulvinaria psidii*, Mask., and *Cerococcus hibisci*, Green, is almost negligible, and damage by thrips [*Diarthrothrips coffeae*, Will.], which threatened to be serious on account of the dry season, was mainly checked by the short rains. Spraying coffee with a poisoned bait consisting of ¾ oz. sodium arsenite, 2 lb. jaggery and 4 gals. water was very successful in controlling *Antestia* [*lineaticollis*, Stål].

HANCOCK (G. L. R.). **Annual Report of the Assistant Entomologist.**—*Uganda: Ann. Rept. Dept. Agric. 1925*, pp. 25–28. Entebbe, 1926.

Antestia lineaticollis, Stål, was the most important pest of coffee, and promising results were obtained with a bait-spray of 1 oz. sodium arsenite, 2 lb. jaggery and 4 gals. water. The eggs were found to be parasitised by *Telenomus truncativentris*, Dodd, *Hadronotus antestiae*, Dodd, *Baryconus* sp., *Aprostocetus* sp., and *Anastatus* sp.; the last three are recorded for the first time, but it is not known whether they are parasites or hyperparasites. There is some evidence for supposing that trees of the genus *Canthium*, and possibly also *Tricalysia*, are natural food-plants of *A. lineaticollis*, but at present there is little evidence that the other plants on which it has been found are more than a temporary source of food or of moisture.

Mealybugs caused comparatively little damage to coffee. *Pseudococcus citri*, Risso, is attacked by the larvae of the Coccinellid, *Hyperaspis hottentotta*, Muls., and by the Lycaenid, *Spalgis lemolea*, Druce, the latter having been also found feeding on *P. virgatus*, Ckll. Mealybugs infesting the roots, previously recorded as *P. citri*, have now been identified doubtfully as *P. coffeae*, Newst. Experiments with paradichlorobenzene have shown that 1½ oz. of this substance applied to the bared roots of 3-year-old trees kills the mealybugs, but also damages the plants; promising results were, however, obtained with applications of 1–2½ oz. applied to 7½-year-old trees bared at the base of the roots only.

Lycidocoris mimeticus, R. & P., previously found attacking deeply shaded coffee only, has now been found on unshaded and lightly shaded trees. This Capsid has also been found on wild *Coffea arabica* growing in deep forest shade. Other pests recorded from coffee are the larvae of *Metadrepana* sp., and *Parasa* sp., the Chrysomelid, *Jamesonia* sp. (a very minor pest), the berry-borer, *Stephanoderes hampei*, Ferr., the Sphingid, *Cephonodes hylas*, L., the fruit-fly, *Trirhithrum basale*, Bezzi (in the berries), the cricket, *Brachytrypes membranaceus*, Drury, and *Asterolecanium* sp. The Reduviid, *Margasus afzelii*, St., has been noticed preying on *Dirphya princeps*, Jord. (yellow-headed coffee stem-borer).

Millepedes cause considerable damage to the roots of cotton, particularly seedlings growing in soil that retains little moisture. The Chrysomelid, *Syagrus calcaratus*, F., is a serious pest of cotton in some districts, 1–3 larvae being found at one root, but the damage is not apparent until the plant is 6–8 inches high or has come into flower. Pupation occurs in the soil near the root of the plant attacked. The adults feed on the leaves. This beetle is particularly troublesome where cotton has been grown for two successive years. An Aphid, *Geoica* sp., is a newly observed minor pest of this crop. A variety of Malvaceous plants has been planted between rows of cotton to determine their attractiveness to cotton-stainers. *Dysdercus* spp. were not attracted, and only *Hibiscus cannabinus* and *Sida rhombifolia* attracted *Oxycarenus* spp., while it is doubtful if they belonged to the species that occur on cotton. The following forms of *Oxycarenus* may with tolerable certainty be recorded from Uganda: *O. rufiventris*, Germ., on *Hibiscus* spp., but rare on cotton; *Oxycarenus* sp., probably undescribed, rare, on cotton and *Hibiscus*; *O. fieberi*, Stål (small form) on *Sida* spp., (large form) on *Hibiscus* spp., *Abutilon* spp., *Dombeya* and cotton; and *O. hyalinipennis*, Costa, on cotton. The following species of *Dysdercus* have been recorded during the year: *D. nigrofasciatus*, Stål, on cotton, *Hibiscus* spp., and *Pavonia* sp., and apparently attracted to the fruit of anatto (*Bixa*); *D. fasciatus*, Sign., on cotton and kapok [*Eriodendron anfractuosum*]; and *D. pretiosus*, Dist., on *Sida* sp.

Platyedra gossypiella, Saund. [since identified by Mr. Meyrick as a distinct species] is recorded for the first time from Uganda; it was found on *Hibiscus diversifolius* but not on cotton. The arrangement of the crochets on the forelegs agrees with that described as a character differentiating the form found on *Hibiscus* in Queensland from that on cotton. Other bollworms are a Tineid, bred from *Hibiscus*; *Earias* sp.; *Heliothis obsoleta*, F.; and an unidentified reddish species, which is the most abundant.

Miscellaneous insect pests included: *Pseudococcus sacchari*, Ckll., on sugar-cane; *Megalognatha rufiventris*, Baly, on maize; *Inesida leprosa*, F., on mulberry; *Bruchus ornatus*, Boh., and *B. obtectus*, Say, in stored beans and peas; *Deilephila nerii*, L., on *Picrolema kleineana*; *Monophlebus ficus*, Laing, on *Grevillea robusta*; and *Cosmopolites sordidus*, Germ., on bananas.

De (M. N.). **Eri Silk Worm Rearing.**—*Bihar & Orissa: Dept. Industries*, Bull. 6, 11 pp. Patna, 1925. [Recd. September 1926.]

The climate of Bihar and Orissa is suitable for the rearing of eri silkworms [*Attacus* sp.] in February and March and from July to December, when the temperature ranges from 75° to 85° F., and the relative humidity from 85 to 95 per cent. This bulletin gives instructions for rearing the silkworms, and briefly mentions their natural enemies, which include ants.

Hart (W. C.) & Rengaswamy (S.). **Preliminary Investigation into the Cause and Cure of the Spike Disease in Sandal** (*Sandalum album*) **in the North Salem Division, Madras Presidency.**—*Indian Forester*, lii, no. 8, pp. 373–390, 1 map. Allahabad, August 1926.

In the course of this study the insects found on sandal included: Larvae of *Terias hecabe*, feeding on the leaves; *Cryptocephalus* sp., found on the flowers; a Curculionid, *Sympiezomias* sp., which defoliates the trees from May to November; a Buprestid, *Sphenoptera* sp., frequenting the petioles and tender twigs ; a Coccid, *Monophlebus* sp. ; and various Lepidopterous larvae feeding on the leaves at night.

Brittain (W. H.) & Shaw (W. S.). **Preliminary Report on the Application of Calcium Cyanide Dust to the Control of *Helopeltis* in Tea.**—*Planters' Chron.*, xxi, no. 32, pp. 527–531. Madras, 7th August 1926.

A short account of the nature and uses of calcium cyanide is given, one of its great advantages as an insecticide in South India being that it requires no water. The possibility of poisonous substances remaining on the leaves after tea has been dusted requires investigation, but is very remote, as the residue after the gas has been evolved is calcium hydroxide. Preliminary experiments for the control of *Helopeltis* [*theivora*, Waterh.] on tea were made in Travancore with Cyanogas calcium cyanide " A " dust [*R.A.E.*, A, xiv, 74] and " S " dusting mixture, the latter consisting of " A " dust diluted with an equal quantity of superfine sulphur, and being especially efficacious against mites. By blowing a small quantity of calcium cyanide dust on to a batch of *H. theivora* that had been collected from the bushes, it was seen that it was extremely toxic to this Capsid, and experiments were accordingly carried out in a tea garden where there was an infestation of approximately 5 bugs to a bush and plucking had been postponed for several weeks on account of the pest. The dusting was performed while rain was falling and there was a considerable breeze, on which account a " cloth trailer " consisting of a sheet 6 by 20 ft. was used to provide protection during the application. The effect of the dusting was judged by collecting all living *H. theivora* from the treated and untreated bushes ; from 53 bushes dusted with " A " dust at the rate of 111 lb. to the acre one living larva, and from 44 bushes dusted with " S " dusting mixture at the rate of 110 lb. to the acre 4 adults were obtained, while 119 larvae and adults were found on 48 control bushes. In another experiment " A " dust was applied at the rate of 100 lb. to the acre, and no living Capsids were found on 120 treated bushes, as compared with 91 larvae and adults on 73 control bushes. The temperature during the experiments was 68–75° F., and the relative humidity 100 per cent. Much further investigation is needed before the use of calcium cyanide for the control of *H. theivora* on tea estates can be recommended, but the above results, although checked by somewhat crude methods, indicate its high toxicity against this pest.

Brittain (W. H.). **Calcium Cyanide and its Utilisation in the Control of Insect Pests in Ceylon.**—*Trop. Agriculturist*, lxvii, no. 1, pp. 45–49, 1 pl. Peradeniya, July 1926.

After a brief discussion of the composition of calcium cyanide and its uses, experiments for controlling various pests during a visit to Ceylon are described.

Numerous colonies of termites, *Termes* (*Odontotermes*) *redemanni*, Wasm., and *T.* (*O.*) *obscuriceps*, Wasm., in lawns and other places were treated by applying calcium cyanide by means of a foot pump through one or more openings in each of the nests, using an average of 4 oz. to a nest ; damp earth was placed round the delivery pipe of the pump and in all the holes from which dust was seen to emerge. In nearly every case the colony was entirely destroyed, but if a part of a colony survives it can easily be destroyed by a second application. Small tests were made with calcium cyanide against the tea termites, *Calotermes militaris*, Desn., and *C. dilatatus*, Bugnion & Popoff, but although those individuals that actually came into contact with the gas were killed, no practical means of introducing it into the interior of the stems could be devised.

For destroying *Xyleborus fornicatus*, Eich. (shot-hole borer) in buried tea prunings [*R.A.E.*, A, xi, 156] calcium cyanide was so successful at dosages as low as ¼ oz. in each hole that this method should repay further investigation. A large proportion of the immature stages and a small proportion of the adults of *Coccus viridis*, Green (green bug of tea) were killed by dusting with calcium cyanide, as were 75 per cent. of the larvae of *Natada nararia*, Moore, but this treatment did not control *Homona coffearia*, Nietn. (tea tortrix).

Ants, *Camponotus* sp., that were troublesome in gardens were successfully controlled by blowing calcium cyanide dust with a foot pump into their nests, which were from several inches to a foot or more below the surface of the ground, or by pouring granular calcium cyanide into them ; by these means 100 per cent. of the insects were destroyed. A Coreid, *Riptortus pedestris*, F., damaging beans and peas, larvae of a Noctuid, *Polytela gloriosae*, Gn., attacking lilies, and *Mylabris* (*Zonabris*) *pustulata*, Thunb., were all found to be susceptible to this dust.

HUTSON (J. C.). **Report of the Work of the Entomological Division.**—*Ceylon Administ. Repts. 1925, Dept. Agric.*, pp. D15–D17. Colombo, July 1926.

Many of the pests recorded in this report are the same as those noticed for previous years [*R.A.E.*, A, xiii, 171 ; xiv, 39]. Tea on one estate was damaged by *Stauropus alternus*, Wlk. Diseased rubber trees were attacked by *Calotermes dilatatus*, Bugn. & Pop., which also damaged the healthier tissues, and rubber trees in a more advanced stage of decay were attacked by *Glyptotermes ceylonicus*, Holmgr., and *Eutermes* sp. Near Kandy an outbreak of *Leucania venalba*, Moore, occurred on rice, and in some fields where there was no water the plants were eaten to the ground. The leaves and pods of *Crotalaria* were attacked by the larvae of the Arctiids, *Argina argus*, Koll., *A. syringa*, Cram., and *Utetheisa pulchella*, L., and *Euproctis* sp. damaged the leaves. Larvae of the Noctuid, *Hylodes caranea*, Cram., defoliated *Albizzia* in one locality. Pests of vegetable crops that were studied included the Pyralid, *Hymenia fascialis*, Cram., on beet, the Pentatomid, *Bagrada picta*, L., on mustard, and the Capsid, *Disphinctus politus*, Wlk., on chillies. Croton oil trees (*Croton tiglium*) were damaged by larvae of the Noctuid, *Amyna punctum*, F., and mango leaves were attacked by the Pyralid, *Orthaga euadrusalis*, Wlk. Stored husked coconuts in Colombo have been attacked by beetles, the most important of which is a Nitidulid, *Carpophilus* sp. ; it appears that only nuts that have been damaged in the soft eye or cracked are liable to infestation.

JEBARATNAM (M. R. M.). **Division of Plant Pests and Diseases Inspection. Batticaloa.**—*Ceylon Administ. Repts. 1925, Dept. Agric.*, pp. D19–D20. Colombo, July 1926.

Outbreaks of *Nephantis serinopa*, Meyr., recurred on coconut in several places, but it can be kept under control by regular cutting and burning of infested leaflets. *Oryctes rhinoceros*, L., and *Rhynchophorus ferrugineus*, F., were less abundant than in the previous year.

The principal pests of rice were *Spodoptera mauritia*, Boisd., *Leptocorisa varicornis*, F., and *Schoenobius incertellus*, Wlk. (*bipunctifer*, Wlk.), minor pests being *Nymphula depunctalis*, Guen., *Parnara mathias*, F., and *Cnaphalocrocis medinalis*, Guen.

CORBETT (G. H.). **Annual Report of the Entomological Division for 1925.**—*Malayan Agric. Jl.*, xiv, no. 6, pp. 171–174. Kuala Lumpur, June 1926.

The distribution and economic importance of *Leptocorisa* spp. are being investigated ; the indications are that *L. acuta*, Thnb., is the most injurious to ripening grains of rice. This crop was severely damaged in 1925 by *Nephotettix bipunctatus*, F., and by the Delphacid, *Sogata pallescens*, Dist. Stored derris was heavily damaged by the Bostrychid, *Sinoxylon anale*, Lesne, which may limit the export of this root unless dealt with in time. Rubber was attacked by the termite, *Coptotermes gestroi*, Wasm., and the tapping surface of the trees by caterpillars of *Acanthopsyche snelleni*, Heyl., and other moths. Pests of coconut palms were larvae of the Limacodid, *Setora nitens*, Wlk., generally found on young plams and controllable by lead arsenate sprays ; the grasshopper, *Valanga nigricornis*, Burm., where giant mimosa had been used as a cover crop ; *Artona catoxantha*, Hmps., present in local outbreaks ; and *Plesispa reichei*, Chap.

Miscellaneous pests included the Coccid, *Phenacoccus iceryoides*, Green, on the rain tree (*Pithecolobium saman*) ; *Papilio demoleus*, L., and Coccids on *Citrus* ; a Cerambycid, belonging to a genus allied to *Callichroma*, boring in the branches of cloves and controlled by injections of ortho-dichlorobenzene ; the Noctuids, *Amyna punctum*, F., on croton, *Tiracola plagiata*, Wlk., migrating from waste lands to cassava, coffee and rubber, and *Agrotis* (*Rhyacia*) *ypsilon*, Rott., on grasses and especially on golf greens ; and the Pyralid, *Hellula undalis*, F., on cabbages.

SOUTH (F. W.). **Annual Report of the Chief Field Officer, 1925.**—*Malayan Agric. Jl.*, xiv, no. 6, pp. 146–159. Kuala Lumpur, June 1926.

Pests other than those recorded in the previous paper include *Erionota* (*Hidari*) *thrax* (skipper caterpillar) and *Stephanitis* sp. on coconuts, of which the first-formed spikes were in one district severely attacked by the greater spike moth, *Tirathaba* sp. near *trichogramma* ; *Nymphula stagnalis* and *Spodoptera pecten* on young rice, particularly in nurseries, and *Scotinophara coarctata* on the growing crop ; and *Sylepta derogata* (leaf-roller) and *Dysdercus cingulatus* (cotton-stainer) on cotton. The grub of a beetle, tentatively identified as *Anomala cupripes*, attacks the roots of a number of plants and is being investigated.

PRIESNER (H.). **Die Jugendstadien der malayischen Thysanopteren.** [The Immature Stages of Malayan Thysanoptera.]—*Treubia*, viii, suppmt., 264 pp., 16 pls. Buitenzorg, July 1926.

This is a morphological study of the immature stages of Malayan Thysanoptera, and includes numerous keys, chiefly to the second-stage larvae.

MENZEL (R.). **Die Thee-Capside** *Helopeltis antonii* **Sign. und ihre Parasiten.** [The Tea Capsid, *H. antonii*, and its Parasites.]—*Rev. suisse Zool.*, xxxiii, no. 3, pp. 379–380, 3 refs. Geneva, June 1926.

A Braconid, *Euphorus helopeltidis*, Ferr., parasitic on *Helopeltis antonii*, Sign., has recently been observed in Java. Hitherto this Capsid has been known to be attacked only intermittently by certain spiders, Mantids and Reduviids, by the Mermithids, *Hexamermis microamphidis*, Stein, and *Agamermis paradecaudata*, Stein, and by a few birds.

The Braconid lays its egg in the host in the earliest stage and causes its death as a nymph, when the larva spins a cocoon on the ground from which the adult emerges in 16–17 days. As many as 50 per cent. of the host have been found to be parasitised by it. Larvae, probably of the same species, have been found in *Pachypeltis vittiscutis*, Bergr., a pest of tea in Sumatra.

Le Scolyte du grain de café.—*Bull. écon. Indochine,* Renseignements, xxix, p. [193]. Hanoi, May 1926.

Coffee beans received in Java and declared to have originated from Cochin China have been found to be infested with *Stephanoderes hampei*, Ferr. Careful investigation of the locality from which they were sent revealed none of this species, though another species of this genus was found. This species is only about half the size of *S. hampei*, and at present it causes very little damage.

HORVATH (G.). **Sur les** *Oxycarenus* **nuisibles aux Cotonniers, avec la description d'une espèce nouvelle.**—*Bull. Soc. ent. France,* 1926, no. 11–12, pp. 135–136. Paris, 1926.

Notes are given on the distribution of the known species of *Oxycarenus* that are pests of cotton, namely, *O. hyalinipennis*, Costa, *O. exitiosus*, Dist., *O. saniosus*, Dist., *O. lugubris*, Motch., and *O. bicolor*, Fieb., and a new species, *O. gossypii*, is described from Cochin China and Formosa. It is allied to *O. hyalinipennis*, the Formosan form differing somewhat from that from Cochin China.

GIBBS (C. S.) & CHEN KEN. **Flacherie or "Wilt Disease" of Silkworms.**—*China Jl. Sci. & Arts.*, v, no. 2, pp. 83–87, 2 pls. Shanghai, August 1926.

Investigations indicate that flacherie in silkworms is an infectious, inheritable disease, which may be difficult to eradicate. It is characterised by a sudden wilting of the larvae soon after the fourth moult or just before they begin to spin their cocoons, and usually causes death. Any that reach the adult stage are feeble, and many of them are sterile. To control the disease the rearing rooms should be well ventilated and kept as near a uniform temperature of 22°–25° C. [71·6–77° F.] as possible. All larvae showing symptoms of flacherie should be burned. Larvae should not be fed on heated or fermented leaves. If, in spite of precautions, silkworms become badly infected they should be at once destroyed, the rearing rooms disinfected and thoroughly cleaned and a fresh start made with new eggs.

Paillot (A.). **Sur la flacherie du ver à soie et ses causes.**—*C. R. Acad. Sci. France*, clxxxiii, no. 6, pp. 402–404. Paris, 1926.

Two of the diseases of the intestinal tract of the silkworm in France that come under the name of "flacherie" were investigated. The determining cause in the one was apparently the dust arising from the handling of the cocoons, and in the other, sudden change of place and conditions immediately after a moult.

Hori (M.). **Studies on** *Rhopalosiphum avenae*, **Fab. (Aphididae).** [*In Japanese.*]—*Hokkaido Agric. Expt. Sta.*, Bull. 17, pp. 1–50, 4 pls. Sapporo, 1926.

Aphis (*Rhopalosiphum*) *avenae*, F., is widely distributed over Japan on a great variety of plants. In Hokkaido, apple, *Crataegus cuneata*, *Pyrus* (*Malus*) *halliana*, barley and maize are the most seriously injured. The eggs laid on the winter food-plants, apple, *C. cuneata*, *P. halliana*, etc., hatch at the end of April when the buds are unfolding, the apterous stem-mothers reaching the adult stage 20 days later. The second generation consists of winged forms only, and these migrate to various Gramineae in June, about seven generations occurring on these summer food-plants. Winged sexuparae and males appear from the end of September, and return to the winter food-plants, upon which apterous oviparous females are produced. The eggs are deposited upon the branches or the basal parts of buds early in November. All the forms of this species moult four times, and the nymphal period lasts about eight days, except in the case of the stem-mother. The females begin to give birth to young 3–5½ days after the last moult, and one stem-mother produces 89 young during life, while other apterous females produce 79·5 on an average.

Natural enemies are the Coccinellids, *Chilocorus similis*, Ross., *Ptychanatis axyridis*, Pall., and *Hippodamia tredecimpunctata*, L., the Syrphid, *Syrphus* (*Episyrphus*) *balteatus*, DeG., the lace-wing, *Chrysopa* sp., the spiders, *Misumena tricuspidata* and *Theridion* spp., a Chalcid and the fungus, *Cladosporium* sp.

Hori (M.). **Studies on** *Macrosiphum matsumuraeanum* **n. sp. (Aphididae).** [*In Japanese.*]—*Hokkaido Agric. Expt. Sta.*, Bull. 17, pp. 51–84, 2 pls. Sapporo, 1926.

Macrosiphum matsumuraeanum, sp. n., is found in Hokkaido and Honshu, and has a wide range of food-plants, of which potato, egg-plant [*Solanum melongena*], *Trifolium incarnatum* and *Arctium lappa* are the chief and are sometimes greatly damaged. Hibernation occurs in the egg stage on *Trifolium* spp., *Arctium lappa* and *Carthamus tinctorius*, etc. In Hokkaido potato mosaic is spread by this Aphid as well as by *Myzus persicae*, Sulz. The eggs begin to hatch in the first part of May, and the adults of the first generation appear two weeks later. The winged forms of the second and third generations migrate to potatoes and other plants in June, where several generations, consisting of both winged and apterous forms, occur during the summer. Winged males and apterous oviparous females appear on the winter food-plants in October and may be seen as late as November. The nymphal stage lasts 7–16½ days, and an apterous female produces 19–72 young in 12–14 days.

Natural enemies are *Syrphus* (*Metasyrphus*) *frequens*, Mats., *S.* (*M.*) *corollae*, F., and *S.* (*Episyrphus*) *balteatus*, DeG., the lacewing, *Chrysop* *sapporensis*, Okam., the Coccinellids, *Ptychanatis axyridis*, Pall. *Coccinella* (*Pyropylea*) *conglobata*, L., and *C. septempunctata*, L., the spiders, *Araneus* spp., *Theridion tepidariorum* and *Clubiona* spp. a Chalcid and a fungus, *Empusa* sp. Spraying the winter food-plants with contact insecticides in the spring and autumn is recommended.

Kinoshita (S.) & Shinkai (S.). **On *Anthonomus signatus*, Roelofs (Curculionidae).** [*In Japanese.*—*Agric. & Hortic.*, i, no. 4, pp 3–12. Tokyo, August 1926.

Anthonomus signatus, Roel., is widely distributed in Japan, infesting strawberry and wild rose. There is one generation a year, hibernation taking place in the adult stage. The weevils begin to be active in the middle of April, feeding on the flower buds, and mate several times. A single egg is laid in a hole made by the rostrum in the bud, and another hole is also made in the stalk in the bud, in which, however, the insect does not oviposit. Usually only one egg is laid in a bud. Oviposition continues for about 2 months ; during this period about 77 eggs are laid by one female. The eggs hatch in 4–9 days, and the larval stage lasts 10–50 days, with an average of 22. The adults emerge 4–9 days after pupation and feed on the young leaves, but soon become inactive, without mating, and remain dormant from June till the next spring.

[Markovich (A.).]. **Марковичъ (А.). A Pest of our Gardens** (*Rhizotrogus solstitialis*, **L.**). [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, iii, pp. 46–48. Sofia, 1926.

An outbreak of larvae of *Amphimallus* (*Rhizotrogus*) *solstitialis*, L., in a vegetable garden was effectively controlled by planting a trap-crop of lettuce, which attracts the larvae.

[Chorbadzhiev (P.).] **Чорбаджиевъ (П.). Locusts harmful in Bulgaria. (Species, Propagation, Damage and Control Organisation.)** [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, iii, pp. 71–88, 16 refs. Sofia, 1926. (With a Summary in French.)

Eighteen species of Acrididae and four of Tettigoniidae are recorded as being regularly or occasionally injurious to crops. The most important is *Calliptamus italicus*, L., and next in the order of importance are *Dociostaurus maroccanus*, Thnb., *Locusta migratoria*, L. (with ph. *danica*, L.) and *Oedipoda coerulescens*, L. Only mechanical methods of control are used in Bulgaria, and there is no special organisation for dealing with locusts.

[Chorbadzhiev (P.).] **Чорбаджиевъ (П.). Notes on some Animal Enemies of Cultivated Plants in Bulgaria in 1925.** [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, iii, pp. 115–134. Sofia, 1926. (With a Summary in German.)

This is an annotated list of pests of cultivated plants observed during 1925 in Bulgaria.

BORCEA (I.). **Dégâts causés par les Bostrychidés en Roumanie.**—*Ann. scient. Univ. Jassy*, xii, no. 3–4, pp. 221–260, 1 map, 32 refs. Jassy, January 1924.

An abstract of this paper has already been noticed [*R.A.E.*, A, xiii, 166]. Large tracts of coniferous forests in Rumania were so seriously attacked by Scolytid beetles during the War that it was found almost impossible to cope with them afterwards. The most serious damage was caused to forests of *Picea excelsa* by *Ips typographus*, L., in association with *I.* (*Pityogenes*) *chalcographus*, L., and to those of *Abies pectinata* by *I.* (*Tomicus*) *curvidens*, Germ., which infests well-developed trees, both diseased and sound, and attacks chiefly the lower part of the trunk, under the bark of which it is found in large colonies, and by *Cryphalus piceae*, Ratz., which prefers young trees and attacks the branches and upper part of the trunk.

Adults and larvae of *Thanasimus formicarius*, Latr., attack the adults and larvae of the Scolytids, and *Rhizophagus ferrugineus*, Payk., and *Nemosoma elongatum*, L., are also always found among attacked trees.

Ips typographus usually has two generations a year, of each of which there are late flights, and the insects do not all emerge at the same time from hibernation, which they pass as adults, pupae or larvae. Generally the flight of the first generation takes place during the last fortnight in April, while that of the second occurs during the first half of July, a complete life-cycle requiring about eight weeks. What has been thought to be a third flight is probably only a late second one. It is possible that the female does not necessarily lay all her eggs at the same time, which renders still more complicated the irregularity of the flight. The life-history of *I. chalcographus* coincides with that of *I. typographus*. The spring flight of *I. curvidens* is early and irregular, the second flight takes place early in July, and there appears to be a third one at the end of August or beginning of September. *Cryphalus piceae* has apparently two generations a year.

The usual control measures are discussed.

REGNIER (R.). **Du rôle des insectes dans la désorganisation d'un arbre. La faune entomologique des peupliers.**—*Actes Mus. Hist. nat. Rouen*, (2) ii, pp. 1–143, 4 pls., 33 figs., 7 pp. refs. Rouen, 1925. [Recd. August 1926.]

The damage done by insects to forest trees is discussed, with special reference to poplars.

FERRIÈRE (C.). **Notes sur les Chalcidiens de la Suisse. 2. Un parasite des oeufs de Psocides.**—*Schweizer ent. Anz.*, v, no. 9, pp. 1–3, 1 fig., 10 refs. Zürich, 1st September 1926.

A Mymarid, *Alaptus minimus*, Wlk., is recorded as parasitising the eggs of Psocids, probably *Caecilius flavidus*, Curt., on the leaves of pear trees.

STAEHELIN (M.). **La désinfection d'un moulin par l'acide prussique gazeux.**—*Terre vaudoise*, xviii, no. 39, pp. 606–608. Lausanne, 25th September 1926.

The advantages of using Zyklon B as a fumigant are described [*R.A.E.*, A, xiii, 64 : B, xiv, 173, etc.]. This material consists of an inert porous carrier impregnated with hydrocyanic acid and certain irritant substances. The latter increase the respiratory activity of the insects, thus enhancing the toxic effect of the poison, and also minimise the danger of accidents by preventing the presence of any traces of the gas from being unnoticed. A case is recorded of the use of this fumigant in a flour mill at Geneva infested with the meal moth [*Ephestia kühniella*, Zell.]. The space to be fumigated was 423,792 cu. ft., and for this 150 boxes of the fumigant, each containing about 3·3 lb. of hydrocyanic acid, were used. The results seem to be entirely satisfactory.

SCHRADER (F.) & HUGHES-SCHRADER (S.). **Haploidy in *Icerya purchasi*.**—*Zeitschr. wiss. Zool.*, cxxviii, no. 1, pp. 182–200, 1 pl., 6 figs., 12 refs. Leipzig, 24th July 1926.

A small proportion of the developing eggs of *Icerya purchasi*, Mask., shows only two chromosomes in all cells, the rest being characterised by four chromosomes. All males, from the earliest stage in which sex can be recognised, have only two chromosomes in all cells, that is, they are haploid. The evidence suggests that the haploid males arise from unfertilised eggs that have undergone normal reduction, in the same manner as eggs that are fertilised.

TEMPEL (W.). **Auftreten eines Stachelkäfers** (*Mordellistena beyrodti* **v. Lengerken) an Orchideen.** [The Occurrence of *M. cattleyana* on Orchids.]—*Die kranke Pflanze*, iii, no. 9, pp. 161–164, 1 pl. Dresden, September 1926.

In 1925 injury to leaves of *Cattleya labiata* at Dresden was found to be due to the larvae of *Mordellistena cattleyana*, Champion (*beyrodti*, v. Lengerken), a beetle introduced into Germany from Colombia and Venezuela. Oviposition, which begins a few days after the adults emerge, occurs chiefly on the mid-rib, on the upper leaf-surface only, between early May and the end of July. The larva mines the parenchyma between the leaf-surfaces. It does not leave the original leaf either to feed or to pupate. The adult is active by day and rests at night on leaves, moss, etc. In specimens of *C. labiata* imported from Brazil a varietal form was found, here described as ab. *nigra*, n. Besides the habitats recorded by von Lengerken, this beetle has been found on *Cattleya* from British Honduras and Brazil, and on *Vanda coerulea* from the Himalayas and Burma.

The collection of the adults and fumigation with nicotine are the measures advocated. In cases of very severe infestation the removal of infested leaves may be necessary, but this is a drastic and costly method involving the destruction of many plants.

HASE (A.). **Ueber die Nester der Wachsmottenraupen und der Aphomiaraupen.** [The Nests of the Caterpillars of the Wax Moth and of *Aphomia*.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xiv, no. 4, pp. 555–565, 5 figs. Berlin, April 1926. [Recd. September 1926.]

Particulars are given of the nests of the caterpillars of the wax moth, *Galleria mellonella*, L., and of *Aphomia sociella*, L., in Germany. The latter infests the nests of bumble-bees.

Börner (C.). **Phänologie und Bekämpfung der Blattreblaus.** [Phenology and the Control of Leaf *Phylloxera*.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 9, pp. 67–71. Berlin, September 1926.

In the German vine-growing regions the leaf-infesting form of *Phylloxera* has never been recorded except when brought about artificially. This is considered to be due to the winged individuals occurring so late (usually not before mid-July) that their immediate progeny fail to mature and to deposit the winter eggs that yield the leaf-infesting forms in spring. In southern countries the leaf forms appear in part only in some years after hot summers and in part every year, but in varying abundance. In countries where they do occur they can increase to the point of seriously interfering with the increase of wood. Such measures as disinfecting vines intended for distribution, winter treatment aiming at the destruction of winter eggs, and the removal of the first galls on American vines are therefore carried out as a regular practice. Though not directly affected, German viticulture is interested in the question of checking these forms in view of the large imports of foreign stocks for the cultivation of grafted vines, and some observations on this point made by the author in Austria are recorded. The development of leaf-infesting forms can be completely checked during a given year by Grassi's method of removing and destroying the 4–6 lowest leaves of the year's shoots, but this does not prevent the appearance of winged individuals in the summer and the subsequent deposition by them of winter eggs producing leaf-infesting forms in the following spring. Therefore, importance attaches to the observation, recorded by Grassi and now confirmed in Austria, that the first galls never occur on one-year-old plants, and are merely occasional on two-year-old ones, becoming abundant only after three or more years. A treatment of American vines and hybrids that ensures only one-year-old wood being above ground should result in the absence of infestation by leaf-infesting forms. This could be attained by suitable pruning followed by covering up the plants with earth, leaving only the one-year-old wood exposed. The covering can be taken off in September when it is certain that winged forms can no longer appear. Experiments on these lines are being made in Austria. Young nursery vines are just as free from attack as one-year-old wood, probably because they are not suited for infestation at the time when the winter eggs hatch. In conclusion, the danger of the introduction of *Phylloxera* into Germany on one-year-old wood seems to be much less than hitherto supposed. The disinfection of such material must be continued, but other measures can be rendered less drastic or even abandoned.

Trappmann (W.). **Prüfung von Raupenleimen.** [Tests of Sticky Banding Materials.]—*Nachrichtenbl. deutschen Pflanzenschutzdienst*, vi, no. 10, pp. 80–81. Berlin, October 1926.

A series of tests with a number of proprietary banding materials are described. Nearly all of these were of German make and belonged to three classes: yellow adhesives containing resins, semi-dark adhesives containing greases, and dark adhesives prepared with tar products. The field tests showed that some brands from each class were excellent. Greasy or tarry compounds must be applied thickly, and the surface must be roughened from time to time. One tarry adhesive was superior in resistance to heat and weather. Tests in a room in dry air of 18°–20° C. [64·4°–68° F.] and in a greenhouse in damp air of 25°–45° C. [77°–113° F.] confirmed these results, though the differences between the various brands were less marked.

Herfs (A.). **Oekologische Untersuchungen an** *Pediculoides ventricosus* **(Newp.) Berl.** [Ecological Investigations on *P. ventricosus*.]—*Zoologica*, xxviii, no. 74, pp. 1–68, 1 pl., 1 fig., 14 tables, 5 pp. refs. Stuttgart, 1926. [Abridged as :] **Beiträge zur Oekologie der Milben** (*Pediculoides ventricosus* **Newp. Berl.**).—*Sitzber. Naturhist. Ver. preuss. Rheinl. u. Westf.*, ***1925***, pp. A1–A10. Bonn, 1926.

Sexual dimorphism is so pronounced in *Pediculoides ventricosus*, Newp., that the sexes might be thought to belong to different species. This mite is an ectoparasite of insect larvae ; the author has found it in cotton seed, imported from Cyprus or Egypt and infested with *Platyedra* (*Gelechiella*) *gossypiella*, Saund. The following observations were all made at 25° C. [77° F.]. The larvae of the meal moth [*Ephestia kühniella*, Zell.] are not usually attacked. The adults of the usual hosts are generally unmolested, but newly-emerged Lepidoptera, such as *Tineola bisselliella*, Hummel, may be attacked.

The female mite seeks a suitable host larva, injects some poison that incapacitates and then kills it, and then begins sucking it. Gradually the abdomen of the mite swells to a spherical shape and to such a degree that it is incapable of movement. In 10–11 days it begins to bear young, the individuals of both sexes being fully formed and sexually mature. The largest number of young in a day was 36, and the largest total produced by a female was 242. They may be produced for 9–33 days. In one case 151 small mother-spheres were found on a moth larva ; they produced 926 young (all females), an average of 6·1. This faculty of producing young from dwarf spheres is of vital importance to the maintenance of the species. Of 7,286 individuals counted, only 266 (3·6 per cent.) were males. The males remain on the mother-sphere and parasitise their own parent, without any apparent effect on the latter. Males can live for 20–30 days under suitable conditions, but die within 20 hours if deprived of food. A male remains close to the natal aperture, and whenever a female appears, it seizes the latter, draws it out and mates with it. It never assists another male to emerge. The fertilised female immediately seeks a new host for attachment and feeding, and rarely survives a fast of 48 hours. If no male be present on the mother-sphere, the females remain on it, up to 50 having been found collected there until a male appears and mates with them in turn. On an average a single male mates with 28 females. Unmated females may, however, sometime leave the mother-sphere and reproduce parthenogenetically, their offspring being all males. The males require to mate repeatedly, and in the absence of females struggles with other males result in their falling off the sphere, this tending to prevent the presence of superfluous males.

In the unabridged paper the author briefly reviews attempts that have been made to control insect pests by means of this mite [*cf. R.A.E.*, A, vii, 163], which have not been attended with much success.

In this connection he refers to the danger of the mite causing dermatitis in man, though no case of it was observed by him in a number of workers who were concerned in his experiments.

GOFFART (H.). **Morphologische und biologische Unterschiede pflanzenparasitierender Nematoden.** [The Morphological and Biological Differences in Nematodes infesting Plants.]—*Zeitschr. Pflanzenkr.*, xxxvi, no. 9–10, pp. 257–263, 5 figs. Stuttgart, 1926.

To meet the difficulty experienced in specifically identifying Nematodes in the larval stage, the characters of the most commonly occurring larvae are enumerated with short descriptions of their adult forms, the differences being shown in a table for males, females and larvae. The species concerned are *Tylenchus dipsaci*, Kühn, *T. tritici*, Bauer, *Aphelenchus fragariae*, R.-B., *A. ormerodis*, R.-B., *A. olesistus*, R.-B., *A. olesistus* var. *longicollis*, Schwarz, *A. ritzemabosi*, Schwarz, *A. phyllophagus*, Stewart, *A. neglectus*, Rensch, *Heterodera schachtii*, Schm., and *H. radicicola*, Greef.

KOMÁREK (J.). **Zur Verbreitung des** *Ips typographus* **und** *Ips cembrae* **in mitteleuropäischen Waldungen.** [The Distribution of *I. typographus* and *I. cembrae* in Central European Forests.]—*Forstw. Centralbl.*, xlvii, pp. 858–865, 1 fig., 1925. (Abstract in *Zeitschr. Pflanzenkr.*, xxxvi, no. 9–10, p. 312. Stuttgart, 1926.)

In Bohemia outbreaks of the nun moth [*Lymantria monacha*] have been followed by infestations by bark-beetles, but these did not include *Ips typographus*, which apparently does not occur below 2,600 ft. *Ips cembrae*, Heer, is found throughout Europe and Asia wherever larch has been grown or is growing. It is now menacing spruce in plantations.

The Organisation and Requirements of Applied Entomology.—*Anz. Schädlingsk.*, ii, no. 9, pp. 110–126. Berlin, 15th September 1926.

The above subject is discussed in a series of papers dealing with various countries, the situation in Germany being reviewed by K. Escherich, that in Switzerland by O. Schneider-Orelli and others, that in Hungary by J. Jablonowski, that in Rumania by Knechtel, and that in Italy by B. Trouvelot.

[PARFENT'EV] PARFENTJEV (I. A.). **Bekämpfung der Wanderheuschrecken in ihren Brutplätzen.** [Work against Migratory Locusts in their Breeding-places.]—*Anz. Schädlingsk.*, ii, no. 9, pp. 127–131, 5 figs. Berlin, 15th September 1926.

This is a brief account of the breeding-places of *Locusta migratoria*, L., in South Russia, with a review of the usual methods of control, including dusting from aeroplanes [*R.A.E.*, A, xiv, 30].

[EREMEEVA (A. M.).] **Еремеева (А. М.).** *Entomophthora sphaerosperma*, **Fres., on the Caterpillars of the Cabbage Butterfly and on the Apple Sucker.** [*In Russian.*]—Bolezni Rastenii [*Plant Diseases*], xiv, nos. 2–3, pp. 100–103, 3 figs., 4 refs. Leningrad, 1925. (With a Summary in German.)

An epidemic is recorded from Kursk (Russia) in 1919 of *Entomophthora sphaerosperma* in caterpillars of *Pieris brassicae* (cabbage butterfly) and in *Psylla mali* (apple-sucker). The mortality was very high; *P. mali* was practically exterminated and has not since reappeared in the region.

[TRAUT (I. I.).] **Траут (И. И.). Report on the Activities of the Gas Expedition in 1925.** [*In Russian.*]—*Nauchno-Issledovat. Lab. O.V. Ozra Narkomzema*, 107 pp. Saratov, 1926.

This is a detailed account of the work carried out as planned [*R.A.E.*, A, xiii, 441] against outbreaks of agricultural pests. The only insects dealt with were locusts, which in the autumn of 1924 were occupying an area of 29,700 acres in the Volga region. A large number of the locusts were destroyed by a bacterial disease, and this, combined with the use of arsenicals either as baits or by sprays, entirely prevented any injury to crops.

[VINOGRADOV-NIKITIN (P. Z.) & ZAÏTZEV (F. A.).] **Виноградов-Никитин (П. З.) и Зайцев (Ф. А.). Materials for a Knowledge of Bark-beetles of the Caucasus.** [*In Russian.*]—*Bull. Polytech. Inst. Tiflis*, ii, pp. 257–293, 14 refs. Tiflis, 1926. (With a Summary in German.)

The first part of this paper contains an annotated list of 107 bark-beetles recorded from the Caucasus. These include a species of *Lymantor*, from *Acer campestre*, which is apparently new.

The second part deals with the biology of bark-beetles in general, and their relation to different types of forests and to the local forestry methods employed. The control of the beetles requires further study, but the basic principles recommended are clean cultivation, and the removal of all forest material during the winter before the spring flight of the beetles.

[RUSINOVA (K. I.).] **Русинова (К. И.). The Food of Sparrows according to an Analysis of the Stomach Contents.** [*In Russian.*]—*Bull. Univ. Asie centr.*, 1926, no. 13, pp. 159–175, 1 pl., 12 refs. Tashkent, 1926. (With a Summary in English.)

An examination of the stomach contents of various species of sparrows shows that the nestlings are fed entirely on insects, which also form 77·78 per cent. of the food of the young birds. The adults feed mainly on plant food. Only 5·5 per cent. of their diet consists of insects, and 9·89 of their total food is obtained from cultivated plants. The destructiveness of the birds is due to their great numbers.

[VERESHCHAGIN (B.).] VERESCEAGHIN (B.). **On the Agricultural Pests observed in Bessarabia in 1925.** [*In Russian.*]—*Furnika*, no. 14, extract, 1 p. [Kishinev] 15th July 1926.

Most of the insect pests here recorded have been noticed from previous reports [*R.A.E.*, A, xi, 43, 149]. Others are *Hoplocampa brevis*, Klug, the larvae of which attack the young fruit of pears; *Haplothrips tritici*, Kurdj., causing considerable damage to wheat; and *Reticulitermes* (*Leucotermes*) *lucifugus*, Rossi, and *Lecanium persicae*, F., attacking vines.

[Vereshchagin (B.).] **Верещагин (Б.). Termites.** [*In Russian.*] —*Furnika*, no. 17, pp. 127–128. [Kishinev] 1st September 1926.

A brief and popular account is given of *Reticulitermes* (*Termes*) *lucifugus*, Rossi, which causes considerable damage to timber and vines in Bessarabia. Soil fumigation with carbon bisulphide applied by means of cotton wool pads is recommended. Infested wood should be burnt or fumigated with chlorine or hydrocyanic acid gas.

[Vereshchagin (B.).] **Верещагин (Б.).** *Gryllotalpa gryllotalpa*, **L.** (*vulgaris*, **Latr.**). [*In Russian.*]—*Furnika*, no. 15, pp. 111–112. [Kishinev] 1st August 1926.

Gryllotalpa gryllotalpa, L., has recently been particularly abundant in Bessarabia. Its bionomics are briefly described, the remedial measures recommended being trapping, injection of carbon bisulphide in the soil, and poison baits.

Rozsypal (J.). **Die Aelchenblattkrankheit der Chrysanthemen in Mähren 1925.** [The Nematode Leaf Disease of Chrysanthemums in Moravia in 1925.]—*Centralbl. Bakt. Paras. Infekt.*, 2te Abt., lxviii, no. 8–14, pp. 179–195, 2 figs., 20 refs. Jena, 10th September 1926.

In 1925 *Aphelenchus ritzemabosi* infested chrysanthemums in nearly all nurseries in Moravia, the characteristic brown spots appearing in June and July. The way in which eelworms penetrate into a plant is unknown, and the various hypotheses that have been advanced in this connection are discussed. A brief survey is made of different methods of dealing with this pest. It is destroyed by exposure to a temperature of 50° C. [122° F.] for 5 minutes.

de Koning (M.). **De beteekenis van** *Pissodes notatus* **Fabr., voor onzen boschbouw.** [The Importance of *P. notatus* in Dutch Forestry.]—*Tijdschr. Plantenziekten*, xxxii, no. 9, pp. 249–251. Wageningen, September 1926.

The small pine weevil, *Pissodes notatus*, F., has been considered to be one of the most dangerous pests of conifers in Holland, but under the conditions obtaining there it is of little importance. It occurs in both young and old pine trees, but the infestation is scattered, and when a primary attack is noticed in young plants the latter can be removed and burned. As a rule, the attack is secondary, only trees that are growing badly or have been injured being infested. With the increase of forests of mixed stands *P. notatus* will probably disappear altogether.

Petherbridge (F. R.) & Dillon-Weston (W. A. R.). **Trials of Tar-distillate Washes in East Anglia in 1926.**—*Jl. Minist. Agric.*, xxxiii, no. 7, pp. 592–600. London, October 1926.

The trials described give further evidence of the value of some of the tar-distillate washes as winter sprays on apples and plums against *Anuraphis roseus*, Baker (rosy apple aphis), leaf-curling plum aphis [*A. helichrysi*, Kalt.], and Lepidopterous pests [*R.A.E.*, A, xiv, 400, etc.].

Although some slight effect was noticed on apple Capsids [*Plesiocoris rugicollis*, Fall.], it was not sufficient to permit of the reduction of the ordinary routine spraying for this pest [*R.A.E.*, A, xiv, 303]. The tar-distillate washes that control Aphids and caterpillars are useful in the control of *P. rugicollis* in that they make the ordinary contact spraying for Capsids more effective by reducing the number of leaves curled by Aphids and the shelter provided by caterpillars in spinning the leaves together. At Wisbech the actual number of Capsids was also slightly reduced.

THOMPSON (W. R.). U.S. Bur. Ent. **La théorie mathématique de l'action des parasites entomophages et le facteur du hasard.**—*Ann. Faculté Sci. Marseille*, 2nd Ser., ii, pt. 2, pp. 69–89, 4 refs. Marseilles, 1924. [Recd. October 1926.]

The fact that parasites may distribute their eggs haphazard among healthy as well as previously parasitised hosts has only very slight influence on rapidity of increase of the percentage of parasitism until such time as the host is almost exterminated. The method of adapting suitable formulae [*R.A.E.*, A, x, 386, 519] for varying conditions is discussed.

VARRICHON (M.). **Dégats causés par des insectes aux chambres de plomb dans les usines productrices d'acide sulfurique.**—*Terre vaudoise*, xviii, no. 40, pp. 628–629. Lausanne, 2nd October 1926.

The injury caused to lead vats in a sulphuric acid factory was found to be due to larvae, one individual being tentatively identified as *Cossus* sp. A larva of this genus was then confined in a tube of lead about $\frac{1}{5}$ in. thick. At the end of three days it had bored through and escaped. Other instances of insects attacking lead are reviewed [*cf. R.A.E.*, A, x, 60].

BERRO AGUILERA (J. M.). **Memoria de las experiencias e investigaciones realizadas en la Estación de Patología Vegetal de Almería durante el año 1926, sobre la** *Ceratitis capitata* **y otras enfermedades de las uvas de Ohanes.** [Report of Work done in 1925 at the Plant Pathology Station at Almeria on *C. capitata* and Diseases of Ohanes Grapes.]—*Estac. Pat. veg. Almería*, 54 pp. Almeria, 1926.

The portion of this report dealing with *Ceratitis capitata*, Wied. (Mediterranean fruit-fly) has already been noticed [*R.A.E.*, A, xiv, 413].

[**Reports on the State of Crops in each Province of Spain on the 20th August 1926.**]—*Bol. Agric. téc. y econ.*, Sec. oficial, xviii, no. 212, pp. 580–594. Madrid, 31st August 1926.

In Granada the olive fly, *Dacus oleae*, caused serious loss in the olive groves, and the almond crop was materially reduced by *Aglaope infausta*. In Toledo melons were attacked by the Coccinellid, *Epilachna argus*.

Blair (K. G.). **Entomological Notes with the Cancer Field Commission in the Trentino, 1925.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 16, pp. 294–298, 2 figs. London, 16th August 1926.

In the course of these observations *Porthetria* (*Ocneria*) *dispar* (gipsy moth) was commonly found, and the larvae were evidently largely parasitised by a Braconid, though many of the cocoons of this parasite produced only the hyperparasitic Chalcid, *Monodontomerus obscurus*. *Anastatus bifasciatus* was reared from the eggs of *P. dispar*.

Leonardi (G.). **Elenco delle specie di insetti dannosi e loro parassiti ricordati in Italia fino all'anno 1911. Parte II. Fascicolo 3.** [Catalogue of Harmful Insects and their Parasites recorded in Italy to the Year 1911.]—*Ann. R. Scuola sup. Agric. Portici*, Ser. 3, i, pp. 148–259. Portici, 1926.

Coleoptera are dealt with in this part of a list of which previous sections have already been noticed [*R.A.E.*, A, xii, 105; xiii, 57; xiv, 98].

Malenotti (E.). **Gli insetti utili alle piante coltivate.** [Insects useful to Cultivated Plants.]—Cr. 8vo, viii+143 pp., 54 figs. Casale Monferrato, Fratelli Ottavi, 1926. Price, *Lire* 10.

This volume deals exclusively with beneficial insects and particularly with the species of value in Italy and the methods of utilising them. The Coccinellid beetle, *Novius cardinalis*, and the Chalcids, *Prospaltella berlesei* and *Aphelinus mali*, are the chief species dealt with.

Savastano (L.). **La poltiglia solfocalcica "Formola della Stazione di Agrumicoltura" e l'arboricoltore. 5a Edizione.** [The Lime-sulphur Spray made to the Formula of the Citrus Experiment Station of Acireale and the Arboriculturist. 5th edition.]—*R. Staz. sperim. Agrum. e Fruttic.*, Boll. 58, 21 pp., 4 figs. Acireale, June 1926. [Recd. September 1926.]

This new edition is a résumé of the information given in a number of bulletins, most of which have been noticed [*R.A.E.*, A, ii, 412, 609; iv, 158, 222; v, 45, 471; xi, 298; xii, 125].

Malenotti (E.). **Fumigazioni cianidriche a Pescantina.** [Fumigation with Hydrocyanic Acid Gas at Pescantina.]—*Italia agric.*, August 1926, reprint, 10 pp., 6 figs. Piacenza, 1926.

A. Sansone Capogrosso has invented a system of fumigation with hydrocyanic acid gas in which large tents, capable of enclosing several trees and made of a light-weight semi-permeable fabric, are used. The results of tests with eleven such tents, enclosing from 1 to 3 peach trees each, are tabulated, the pests dealt with being the Aphids, *Hyalopterus arundinis* (*pruni*) and *Myzus* (*Anuraphis*) *persicae*. The dosages used are not given, but it is stated that the results were very satisfactory and the plants were not scorched. All Diptera present were rapidly killed; Coleoptera were more resistant, *Anomala vitis* and the Elaterid, *Lacon murinus*, surviving for two days.

COTTERELL (G. S.). **Preliminary Study of the Life-history and Habits of** *Sahlbergella singularis*, **Hagl., and** *Sahlbergella theobroma*, **Dist.** —*Gold Coast Dept. Agric.*, Bull. 3, 26 pp., 8 pls., 1 ref. Accra, June 1926.

Sahlbergella singularis, Hagl., and *S. theobroma*, Dist., occur throughout the cacao-growing countries on the mainland of the west coast of Africa, but they have not been reported from St. Thomé and Fernando Po, the oldest cacao-exporting countries of this region. It has been suggested that they may exist on these islands, but that they are kept in check by natural enemies to such an extent that they have been overlooked.

The feeding habits of the two species are somewhat different. *S. theobroma* feeds and breeds on young trees, from 1 to 5 years old according to the amount and nature of growth, and upon pods of trees of any age. The eggs are usually laid in the first and second year wood, the nymphs feeding on the newer wood. The older wood is only attacked as the tree is gradually killed back. *S. singularis* lays its eggs almost anywhere on the plants, and feeds, with the exception of the first instar nymph, on the older wood. The appearance of the attacked trees is described and illustrated [*cf.* *R.A.E.*, A, ii, 670]; as a rule infestation is only noticed when well advanced, but it is important to ascertain the presence of the bug on the tree before carrying out remedial measures. The number of individuals present is exceedingly small compared with the amount of damage done; breeding begins on a very few trees, and in the case of *S. theobroma*, the adults resulting from this generation oviposit on adjacent trees before moving elsewhere. Oviposition does not occur on the same tree in the same season, the attack passing through a plantation in a wave. In the case of *S. singularis* attacking older trees, conditions are somewhat different, as one tree may support three or four generations. Both species may breed under pods, usually as the latter are ripening; the damage is confined to sheltered parts of the pod, such as under the proximal portion where it is in contact with the stem. Fungous disease often follows attack. In the case of *S. singularis* attacking older trees, the soil shade is destroyed and secondary bush rapidly grows up, crowding out the plantation. Both species depend on the seasonal flushes of growth and development of pods for increase. They are reduced to almost negligible numbers after the crop is harvested and the dry season sets in, but increase again after the first rains, resulting in the first flush of growth.

There are small differences in the life-history of the two species, the data given having been obtained from individuals bred on caged pods and trees three or four years old.

The egg stage lasts approximately 14 days in the case of *S. theobroma*, and 16 in that of *S. singularis*. The nymphal stage varies according to the state of the food material, with a minimum of 18 and a maximum of 26 days, the total period from egg to adult varying from 32 to 41 days. The nymphs of both species are described.

The conditions that predispose a plantation to attack are not known, though it is evident that some are apparently immune. Those on sandy soil and in badly drained areas are usually infested, but the attack is by no means confined to them.

The natural enemies of *Sahlbergella* are exceedingly limited in number and effect. Several casual predators and an undetermined Hymenopterous parasite have been found. The full-grown larva of the parasite emerges from the fifth instar nymph of *S. singularis* and pupates in the vicinity of the dead host. Another Hymenopterous parasite, *Encyrtus cotterelli*, Watrst., was bred from *S. theobroma* in 1921, but is considered of no importance at present.

Cultural measures are of value as a means of assisting the trees to withstand attack. Artificial control is at present confined to hand-picking, spraying and dusting. Hand-picking is impossible in the case of *S. singularis* under ordinary conditions, but large numbers may be collected under pods from September to November, in which position they are accessible and can be killed by a spray consisting of 2 gals. kerosene, 2 lb. soft soap or 1 lb. bar soap, and 1 gal. water, diluted with 15 parts of water.

Spraying or dusting should be done in the early morning or evening when the bugs are active. Nicotine sulphate has proved the most satisfactory insecticide ; it is more efficient as a spray than as a dust. The formula recommended consists of 6 gals. water boiled with ¼ lb. hard soap or double that amount of soft soap, to which, when boiling, 1 oz. 40 per cent. nicotine sulphate is added. A gallon of spray will cover approximately 10–12 trees averaging 5 feet in height and 30–40 leaves on each tree. For trees twice that height approximately four times the amount will be required. As much as 4 gallons may be required for a single tree in the case of full-grown trees.

JOHNSTON (H. B.). **A further Contribution to our Knowledge of the Bionomics and Control of the Migratory Locust,** *Schistocerca gregaria* **Forsk.** (*peregrina* **Oliv.**), **in the Sudan.**—*Wellcome Trop. Res. Lab.*, Ent. Sect., Bull. 22, 14 pp., 1 map. Khartoum, June 1926.

Only the northern half of the Anglo-Egyptian Sudan is liable to invasions by *Schistocerca gregaria*, Forsk., and the higher humidity of the southern provinces does not appear to favour its breeding. The question of the sources whence the invading swarms come to the Sudan remained open until recent observations demonstrated that the swarms may be formed locally from scattered locusts in their solitary phase. It has been proved definitely, both by observations in the field and by breeding experiments, that the locust known as *S. flaviventris*, Burm., is only a solitary phase of *S. gregaria*, as already suggested by Uvarov [*R.A.E.*, A, xi, 456]. The characters of the two phases are described, the solitary phase differing completely both in the external appearance of the immature stages and in its habits of life. The transformation of the solitary phase into the swarming one occurs by a gradual change through two or more successive broods. This process can be reversed by the adoption of suitable control measures, as happened in the Red Sea province in 1926, when the incipient swarms of the migratory phase were thinned out by the application of poison baits, and the scattered survivors turned back to the solitary phase.

HALL (W. J.). **The Hibiscus Mealy Bug** (*Phenacoccus hirsutus*, **Green**) **in Egypt in 1925 with Notes on the Introduction of** *Cryptolaemus montrouzieri*, **Muls.**—*Minist. Agric., Egypt*, Bull. 70, 15 pp., 1 map, 4 pls., 11 refs. Cairo, 1926.

This bulletin is supplementary to previous papers on *Phenacoccus hirsutus*, Green (hibiscus mealybug) in Egypt [*R.A.E.*, ix, 317 ; x, 449, 520] and deals with the status and control of the pest from 1921 to 1925; during that time it has spread from Cairo almost all over Egypt, in spite of legislation regulating the transport of plants; the regulations have, however, been largely evaded.

P. hirsutus attacks almost every kind of plant, but only thrives on a comparatively small number, and these are termed primary food-plants; to those previously listed the shrub, *Tecoma capensis*, is added. The most susceptible of the primary food-plants have proved to be *Albizzia lebbek*, *Bauhinia* spp. (camel-foot), *Ceratonia siliqua* (carob), *Erythrina* spp., *Grevillea robusta*, *Hibiscus* spp., *Morus alba* (mulberry), *Psidium guayava* (guava) and *Zizyphus* spp. *Acacia arabica* var. *nilotica* often appears to be more heavily infested than it really is, owing to the presence of *Pseudococcus perniciosus*, Newst. & Willc. (lebbek mealybug), and *Parkinsonia aculeata* may be very severely attacked, but probably only when unhealthy. Preference for unhealthy trees has been noticed especially in guava plantations, where individual healthy trees may remain uninfested or only slightly infested for some years; the guava plantations are, however, usually badly cultivated and so thickly planted that conditions are ideal for the pest. In an attempt to eradicate *P. hirsutus* from a guava plantation, the trees were heavily pruned and brushed with a strong solution of paraffin emulsion during the winter, all leaves and loose bark being removed; when the trees next fruited, 16 months later, they were heavily infested again.

As spraying has failed to control this pest, on account of the multiplicity of its food-plants and of the difficulty of penetrating to the insects in the deformed shoots, efforts have been concentrated on the removal of all badly infested primary food-plants and their replacement by other species that are not liable to severe infestation, a list of which is given in an appendix. The way in which this method was carried out at the Barrage Gardens in the Nile Delta is described; in this case the trees affected were mainly *Albizzia lebbek*, many of which were very large and old trees riddled by the borer, *Xystrocera globosa*, Ol., mulberries and *Grevillea robusta*, and their removal has freed the Gardens from all serious infestation by *P. hirsutus*. Although the mealybug is not of great economic importance, as the plants most attacked by it are mainly ornamental trees, annuals in gardens such as French beans, and field crops such as cotton may occasionally be attacked by it when close to heavily infested trees. Similarly, seedling mangos and *Citrus* may be injured seriously.

In the summer and autumn of 1922 several small consignments of the Coccinellid, *Cryptolaemus montrouzieri*, Muls., were received in Cairo from the south of France, and the adults were placed in cages with *P. hirsutus*, *P. perniciosus* and *P. citri*, Risso; the beetles bred successfully, and in November a breeding station was started in Upper Egypt in order to liberate adults in the sugar-cane fields, where *P. sacchari*, Ckll. (sugar-cane mealybug) was doing considerable damage. In the laboratory *C. montrouzieri* was reared successfully on *P. sacchari* on cane from which the leaf-sheaths were removed, but in the type of sugar-cane grown in Upper Egypt the leaf-sheaths adhere so closely to the stems until shortly before the cane is cut that in the field *P. sacchari* is entirely protected from *C. montrouzieri*, which is consequently valueless for controlling it.

During the winter of 1922–23 the colony of *C. montrouzieri* in Cairo died out, owing partly to climatic conditions and partly to the fact that the humidity in the insectary was too low, but in May adults were obtained from Upper Egypt and breeding was continued, using *P. hirsutus* as the host. During 1923, 6,030 adult beetles were liberated in eight localities heavily infested with *P. hirsutus*, but in the following spring none could be found. The colony in the insectary was kept through the winter by maintaining a constant temperature of 24–28° C. [75·2–82·4° F.] and damping the floor; *P. sacchari* was used as food. In 1924, 42,620 adults were liberated in two localities, but although they bred and multiplied in the summer and early winter, none was found in the following spring. In 1925, 43,000 adults were liberated in five localities. *C. montrouzieri* undoubtedly reduced infestations of *P. hirsutus* on certain trees under observation, and in view of the similarity of climatic conditions in Egypt to those in other countries where it has been established, it is still hoped that it will become acclimatised if sufficient concentration can be obtained in one locality.

The life-cycle of *C. montrouzieri* in the summer in Egypt varies from 3–5 weeks; the eggs hatch in 3–5 days, and the larvae feed for 2–3 weeks. The pupal stage lasts 6–9 days. Unless abundant food is supplied, both adults and larvae readily feed on larvae of their own species.

JEPSON (F. P.). **Some Preliminary Notes on Tea Termites.**—*Trop. Agriculturist*, lxvii, no. 2, pp. 67–79, 5 pls., 3 refs. Peradeniya, August 1926.

A general account is given of the termites attacking tea in Ceylon and the different types of injury done [*cf. R.A.E.*, A, xi, 315]. Experiments have been carried out to ascertain whether the colonies of *Calotermes*, which are situated in the wood of the bushes, can be reached in a comparatively simple manner, the most readily available insecticides having been used in these tests. Little progress has been made towards the discovery of an insecticide that will destroy all the termites in a bush without affecting its health. In the case of *Calotermes militaris* calcium cyanide was tried in doses varying from $\frac{1}{10}$ to $\frac{1}{2}$ oz., but examinations at intervals of from 16 hours to 12 days indicated that the treatment had been a failure. The method of application was to drill a $\frac{1}{4}$ in. hole into the bush just below soil level; a reducing nozzle, fitted to the delivery pipe of the pump, was inserted in the hole and the calcium cyanide pumped in at great pressure. Other openings in the bush had to be plugged to prevent the dust being expelled through them.

Carbon bisulphide at the rate of 2 oz. to a bush destroyed 95 per cent. of the termites, but also killed the bush. Paradichlorobenzene in doses ranging from $\frac{1}{21}$ to $\frac{1}{8}$ oz. showed no injurious effect on the bushes or termites. A method practised on many estates consists of pouring Jeyes' fluid or some oil insecticide into the central cavities of infested bushes. As these materials kill by contact only, a large number of the termites escape and are able to found fresh colonies, and this method can only be applied in advanced cases of attack where the central cavity can be reached through an external opening.

The same difficulty in reaching the colony is experienced with *C. dilatatus* and *C. greeni*. Carbon bisulphide at the rate of $\frac{1}{4}$ oz. per bush was introduced through a $\frac{1}{4}$ in. hole bored into the main stem, the hole being immediately sealed with cement and sand. This method proved successful where the gas had penetrated, but the colonies apparently do not all communicate, and two or even three random holes would be necessary to ensure reaching the galleries of all colonies. Similar results were obtained with calcium cyanide.

[GUPTA (S. R.).] **Entomology.**—*Ann. Rept. Dept. Agric. Assam, 1925–26*, pp. 26–27. Shillong, 1926.

The insect pests dealt with in Assam during the year are briefly reviewed; they include the rice case-worm [*Nymphula depunctalis*], successfully controlled by netting the larval cases; rice bugs [*Leptocorisa varicornis*], checked to some extent by the collection of egg masses; *Aulacophora abdominalis*, a serious pest of cucurbits, which may be controlled by dusting with Paris green mixed with 8 parts of road dust; *Agrotis ypsilon*, a serious pest of cold weather vegetable seedlings; *Athalia proxima* (mustard saw-fly); and *Rhinchocoris* sp., causing damage to orange fruits.

KUWANA (I.). **The Diaspine Coccidae of Japan. IV. Genera** *Cryptoparlatoria, Howardia, Sasakiaspis, Diaspis, Aulacaspis, Pinnaspis* **and** *Prontaspis.*—*Dept. Finance, Japan, Imp. Plant Quar. Serv.*, Tech. Bull. 4, 44 pp., 12 pls., 4 figs. Yokohama, August 1926.

The species dealt with in this part [*R.A.E.*, A, xiv, 140] are *Cryptoparlatoria leucaspis*, Lindgr., on *Cryptomeria japonica*; *Howardia biclavis*, Comst., occurring in the Bonin Islands, but not on the main islands of Japan; *Aulacaspis pentagona*, Targ., and *Chionaspis difficilis*, Ckll. (for which the author erects the new genus *Sasakiaspis* with *A. pentagona* as the type); *Diaspis boisduvali*, Sign., on cactus; *D. bromeliae*, Kern., on pineapple and *D. echinocacti*, Bch., on cacti, in greenhouses; *D. zamiae*, Morg., not recorded from Japan since 1923; *Aulacaspis rosae*, Bch., on roses and *Rubus*; *A. spinosa*, Mask., on *Smilax*; *A. crawi*, Ckll., found in California on plants of *Eleagnus umbellata* from China, but not recorded from Japan since the earthquake of 1923; *A. latissima*, Ckll., on *Distylium racemosum*; *A. yabunikkei*, sp. n., on *Cinnamomum pedunculatum*, and also apparently the same species on *C. camphora* in Formosa; *A. wakayamaensis*, sp. n., on *Ischaemum antheporoides*; *Pinnaspis aspidistrae*, Sign., on many plants; *P. minor*, Mask., and *P. minor strachani*, Cooley, recorded from Japan, but not found by the author; and *Prontaspis yanonensis*, Kuw., which is one of the most serious pests of orange trees, often causing the death of the branches and even the trees. *P. citri*, Comst., has been erroneously recorded from Japan, having been confused with *P. yanonensis*. Descriptions are given of all the species, with particulars of their food-plants and distribution.

JARVIS (H.). **The Queensland Fruit Fly** (*Chaetodacus tryoni*, **Froggatt**).—*Queensland Agric. Jl.*, xxvi, pt. 2, pp. 101–104, 1 pl. Brisbane, 1st August 1926.

Many kinds of fruits in Queensland are damaged by the larvae of *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.), which feed in them and cause them to rot. The eggs are laid in the ripening fruit, usually in batches of 6–8, in punctures made with the ovipositor, and hatch in about 48 hours in warm weather. The larvae, on hatching, immediately begin tunnelling in the fruit and become full grown in 5–7 days under favourable conditions; they develop more rapidly in soft drupaceous fruits, such as peach and plum, than in the harder pomaceous ones, such as apple, pear and quince. The mature larvae leave the fruit and enter the soil, where they pupate, rarely at a greater depth than 2 ins. The pupal stage lasts about a week in the summer, but may extend over many months in cold weather. The adult females do not begin to lay eggs until about 14 days after emergence ; the number of eggs laid by each is not definitely known, but in dissected individuals the ovaries contained from 50 to 60. The life-cycle from egg to adult occupies about 3 weeks in summer.

The Braconid, *Opius tryoni*, Silv., lays its eggs in the larvae of *D. ferrugineus*, which it finds by probing the fruit with its ovipositor. This parasite undoubtedly plays an important part in controlling the fruit-fly in the wild fruits that it attacks, and it has also been bred from fruit-fly larvae in citrus fruits and peaches. Several other parasites of the larvae and predators on the adults may be of some value.

The most important control measure is the gathering and destruction of infested fruit [*R.A.E.*, A, xiv, 366]. A bait-spray consisting of 4 lb. molasses, 2½ oz. lead arsenate powder, and 4 gals. water or 3 gals. water and 1 gal. fruit juice (made by boiling any fairly good waste fruit) may be used. Glass fly-traps, set on boards and hung in large leafy trees, have given good results ; they should be placed in the orchard at least three or four weeks before the first fruit is ripe, and if possible a teaspoonful of bait should be added every day and they should be cleaned out once a week. Co-operation among fruit-growers is essential for the best results to be obtained from control measures.

JARVIS (H.). **The Woolly Aphis Parasite** (*Aphelinus mali*, **Hald.**).—*Queensland Agric. Jl.*, xxvi, pt. 2, pp. 105–108, 1 pl., 1 ref. Brisbane, 1st August 1926.

A brief account is given of the life-history of *Aphelinus mali*, Hald. [*R.A.E.*, A, xiii, 177], which was introduced into the Stanthorpe district of Queensland from New Zealand in 1923 to control *Eriosoma lanigerum*, Hausm. (woolly apple aphis). At Stanthorpe, although a few individuals may emerge earlier, the adults of *A. mali* mostly appear about the end of August, and the parasite continues to be active until about the end of April. The life-cycle occupies about a month, so that 5 or 6 broods would be possible at Stanthorpe during the season ; adults fed on honey and water lived for 21 days in the insectary, from which it seems probable that they live for two or three weeks under natural conditions. When *A. mali* is established in an orchard, spraying can be carried out without much danger of interfering with it ; one spray applied in the winter for *E. lanigerum* is advisable to to destroy colonies that have developed after *A. mali* has ceased to operate in the autumn. Many of the parasites hibernate in the dead bodies of their hosts attached to cloth bands round the trees, and these, together with all prunings from infested trees, should be stored in a cool place during the winter and placed in the orchard in the spring.

JARVIS (H.). **The Codling Moth** (*Cydia pomonella*, **Linnaeus**).—*Queensland Agric. Jl.*, xxvi, pt. 2, pp. 109–113, 1 pl. Brisbane, 1st August 1926.

Cydia pomonella, L. (codling moth) was first recorded in South Australia in 1883, in New South Wales in 1887, and in Queensland in

1889. It is now present throughout the Commonwealth, and in Queensland it has spread very rapidly in the last twenty years, causing serious losses in the apple- and pear-growing districts. It attacks apples, pears and quinces, and occasionally peaches, nectarines and plums. The life-history is described; in Queensland the life-cycle from egg to adult usually occupies five to eight weeks, and there are normally three broods a year. The control measures given are similar to those recommended in Tasmania [*R.A.E.*, A, viii, 336] except for details as to spraying; apples should be sprayed at least four times, the first or calyx spray, which is applied as soon as the petals have fallen, being the most important; the second should be applied two weeks later, and the third and fourth after further intervals of three weeks. To the spray consisting of 1 lb. lead arsenate powder (or 2 lb. paste) in 50 gals. water, ½ lb. calcium caseinate may be added as a spreader.

MUNGOMERY (R. W.). **Report of the Southern Field Assistant.**—*Queensland Agric. Jl.*, xxvi, pt. 2, pp. 120–122. Brisbane, 1st August 1926.

The Stratiomyiid, *Metoponia rubriceps*, Macq., appears to be confined to one area; the pupae were found in the ground at a depth of 1–1½ in. in the sugar-cane fields, and also under *Imperata arundinacea* (blady grass). During the pupal period of the fly in May and June it should be quite safe to plant cane, and it is probable that there is a second pupal period in the summer months.

BOISVERT (P.). **Un ennemi de nos arbres d'ornement. Le charançon du peuplier et du saule.**—*Nat. canad.*, liii, no. 2, pp. 28–36. Quebec, August 1926.

This is a popular account of *Cryptorrhynchus lapathi*, L. (willow and poplar borer), which is the cause of considerable damage in Canada.

WILLIAMS (C. H. B.). **The Damage caused by the Sugar Cane Moth Borer in Guadeloupe.**—*Sta. agron. Guadeloupe*, Tech. Bull. 4, 28 pp., 1 map, 19 tables. Pointe-à-Pitre, 1926.

The following is taken from the author's summary:—The first results are presented of an investigation undertaken with a view to determining the importance or otherwise of *Diatraea saccharalis*, F. (moth borer) in relation to the sugar industry of Guadeloupe. The figures obtained indicate that a large percentage of canes is attacked. The percentage of juice extracted, its sucrose content and purity are lowered as the number of borer holes in a stalk increases, while the glucose content varies in the same direction as the number of holes in the cane.

MOGENDORFF (N.). **Some Chemical Factors involved in Arsenical Injury of Fruit Trees.**—*New Jersey Agric. Expt. Sta.*, Bull. 419, 47 pp., 5 figs., 35 refs. New Brunswick, N.J., October 1925. [Recd. September 1926.]

Injury to peach trees from the use of arsenical sprays became so prevalent in 1922 and 1923 in New Jersey that a thorough study of the subject was undertaken, the chemical phases of which are presented in this paper. Although the study was confined to peach trees, the results will apply to a certain extent to other plants as well. Defoliation was found to occur even when there were only a few scorched spots visible on the leaf, thus indicating that it is not the destruction of assimilation tissue, but the penetration of toxic substances that causes the leaf to fall. The woody part of the peach tree is also very susceptible to this type of injury. The lead arsenate used throughout the experiments was a fairly pure brand of commercial acid lead arsenate, containing 66·63 per cent. total lead oxide, 32·16 per cent. total arsenic oxide, 0·16 per cent. water-soluble arsenic, and 0·5 per cent. moisture content. The injury to foliage was found to be due to water-soluble arsenic, but it is not the amount present in the powder or paste that causes the damage, but the water-soluble arsenic formed during or after the application to the trees.

The following is the author's summary of the paper :—

Although acid lead arsenate is a very insoluble compound, it is easily decomposed in alkaline media with the formation of a basic lead arsenate and liberation of free arsenic acid. A similar decomposition takes place if acid lead arsenate comes in contact with soluble chlorides, a chloro-arsenate and arsenic acid being formed in this case. When lead arsenate alone is used as a spray on tender foliage as that of the peach, it may cause injury, since its decomposition is favoured by alkaline or saline media resulting from the salts present in the spraying water or excreted by the leaves. When lead arsenate spray is combined with hydrated or freshly slaked lime it will be decomposed and converted into basic lead arsenate and very insoluble basic calcium arsenate. The latter compound will be decomposed by the action of carbon dioxide, chiefly supplied by the respiratory process of the plant. The basic calcium arsenate will be transformed to less basic compounds and then to tri-calcium arsenate, which is very likely soluble enough to cause injury. It is not probable that di- or mono-calcium arsenate is formed as a rule. The slow progress of the various chemical transformation phases mentioned accounts for the phenomenon that injury from lead arsenate does not appear until several weeks after the spray has been applied. Moreover, evidence has been obtained from spraying experiments that the injury is caused only after the arsenic has accumulated in the tissue. It depends greatly on circumstances whether injury will be prevented, or whether a considerable burning and defoliation will result. When rocklime (ground limestone) is added to lead arsenate spray, arsenical injury will result, because a medium favourable for the decomposition of lead arsenate is created, while the chemical affinity between calcium carbonate and arsenic acid is not such that the formation of an insoluble basic calcium arsenate will result. For this reason neither rocklime, nor air-slaked lime, nor hydrated lime which has been exposed to the air for a long time should be used in combination with acid lead arsenate. Magnesium carbonate in contact with lead arsenate also has the tendency to increase the water-soluble arsenic. Therefore the lime used in combination with lead arsenate spray should contain as little of magnesium compounds as possible. It may be stated that the lime to be combined with lead arsenate spray should be either freshly water-slaked quicklime or a high grade calcium lime with a calcium hydroxide content as near to 100 per cent. as possible. Although the small quantity of lime applied to the lead arsenate spray by the addition of calcium caseinate spreaders does increase the water-soluble arsenic, these spreaders have, on the other hand, a beneficial effect. The decomposition of lead arsenate is greatly diminished through the presence of a casein-lime spreader, a phenomenon which is probably of a physical nature. The same favourable effect, though to a less extent, is obtained when skimmed milk preparations are used as spreaders. The lime constituent of dry-mix [8 lb. sulphur, 4 lb. hydrated lime, and 50 U.S. gals. water] has the same effect as when combined with lead arsenate alone in so far as all soluble arsenic is converted into insoluble basic calcium arsenate, which in its turn is decomposed by carbon dioxide. The latter decomposition has a somewhat different effect in the presence of the sulphur constituent of dry-mix. The amount of the water-soluble arsenic formed is larger if sulphur is present. Less arsenic, however, is rendered soluble if the amount of lime is increased. This accounts for the fact that no injury is likely to occur if lead arsenate is applied with self-boiled lime-sulphur [8 lb. sulphur, 8 lb. stone lime and 50 U.S. gals. water]. As the lime-sulphur contains more than 2·5 times as much hydrated lime as dry-mix (8–4–50), a much larger excess of lime is available for the conversion of arsenic acid into insoluble basic calcium arsenate. When combined mixtures of dry-mix and lead arsenate are stored dry for one year no water-soluble arsenic will be present, although part of the lead arsenate may be converted into insoluble basic calcium arsenate. When a mixture of lead arsenate and sulphur flour is stored dry for one year, a chemical interchange between the sulphur and the lead arsenate takes place, resulting in the formation of water-soluble arsenic. From a consideration of the chemistry involved, it has been shown that there is evidence that a lead arsenate-gypsum combination spray may be useful in preventing foliage injury.

SNOW (S. J.). U.S. Bur. Ent. **The Alfalfa Weevil in Nevada and its Control by Spraying.**—*Nevada Agric. Expt. Sta.*, Bull. 108, 22 pp., 4 figs. Reno, Nev., May 1925. [Recd. September 1926.]

The alfalfa weevil [*Hypera variabilis*, Hbst.] was first found in Nevada in 1920, and was presumably introduced into the State by artificial means, as it appeared at places far removed from the nearest part of the previously known infested area ; it has since spread to several of the most important lucerne-growing parts of the State, and over the border into California. The life-history of the weevil, the nature of its injury to lucerne, and various cultural and other methods of control are described [*cf. R.A.E.*, A, v, 1, 211 ; vi, 339]. The European Ichneumonid larval parasite, *Bathyplectes curculionis*, Thoms., is common throughout the infested territory.

Eggs were found by splitting the green lucerne and dead grass stems ; in early May there were 2·4 egg-clusters to 100 green stems, equally divided between freshly laid and old eggs, and in the middle of May there were 4·5 clusters to 100 stems, while by June hatched eggs far outnumbered unhatched. The number of larvae present indicated that less than half the total number of eggs had been laid in green stems, and this was borne out by examination of the dry stems in June, when it was found that they had contained on the average 5·4 egg-clusters per 100.

The relative numbers of larvae and adults present in the lucerne fields were determined by counting the number taken in 100 strokes with a sweeping net ; this method is more reliable for larvae than for adults, as the former feed continuously on the tops of the plants. At the beginning of May both weevils and larvae were scarce, but there was a progressive increase in numbers until the beginning of June with the larvae and the middle of June with the adults. By the end of May over 300 larvae were taken in 25 strokes of the net, indicating the probable necessity for spraying ; there may, however, be many more larvae present before spraying, and the best guide for determining when to spray is the appearance of the fields. If spraying is done within a few days of the time when the fields begin to look greyish as the result of the feeding of the larvae, it will be in time to save the first crop, which is usually cut from two to three weeks later ; it is advisable to spray somewhat late rather than too early, as in the latter case the larvae that hatch after spraying will be unaffected.

In spraying, calcium arsenate, 3 lb. to 100 U.S. gals. water, was applied at a rate equivalent to 2 lb. an acre. In the first week after spraying adults were seven times as numerous on the unsprayed lucerne, but after 12 days they were present in approximately equal numbers on sprayed and unsprayed plots ; this suggested that after feeding on the sprayed foliage the weevils are affected by the poison and drop to the ground, returning to the tops of the plants to resume feeding after an interval of a few days, a supposition that was confirmed by laboratory observations. Reduction of the number of larvae, rather than of adults, is, however, of chief importance, and this the spraying accomplished satisfactorily, as in the month following spraying the average number of larvae taken on the unsprayed plots was 7·55 times the average number taken on the sprayed plots, and the decrease in the number of larvae on the sprayed plots was continuous. In one field where calcium arsenate, 4 lb. to 100 U.S. gals. water, was applied at the rate of $2\frac{2}{3}$ lb. an acre slightly better control was obtained than on the other fields, but the results obtained with the smaller quantity were sufficiently good for practical purposes. In some districts a second spraying 1–2 weeks after the first is necessary, but this was not found to be the case in western Nevada. Cutting too soon after spraying reduces its effect ; moreover, the damage to the second crop of lucerne depends on the number of larvae that survive the spraying of the first crop, and as the spray continues to be effective for at least a week, not less than that time should elapse before it is cut.

Dusting for the control of *H. variabilis* is still in the experimental stage, but promises to become as effective as spraying when improvements have been made in the dusting machinery and when more is known of the factors that influence the sticking qualities of the dusts. Dusting experiments with lead arsenate alone or with calcium arsenate or lead arsenate and sulphur (1 : 4) at from 2 to 4 lb. to the acre were fairly satisfactory, the percentage of the larvae killed being 63 with lead arsenate and sulphur and 73 with the other two dusts.

WALLING (W. L.). **The Relation of Bee-keeping to Horticulture.**—*Proc. 21st Ann. Conv. Tennessee State Hortic. Soc. &c., 1926,* pp. 48–54. Knoxville, Tenn., 1926.

This is a popular account of the pollination of the flowers of fruit-trees by bees, the necessity of which for the production of most orchard fruits is emphasised. Bees are not responsible for puncturing or damaging ripe fruit and only suck juice from fruit that has been damaged in some other way.

Glasgow (H.) & Gambrell (F. L.). **The Cherry Fruit Fly.**—*N. Y. State Agric. Expt. Sta.*, Circ. 87, 10 pp., 2 figs. Geneva, N.Y., 1st June 1926.

Glasgow (H.). **The Cherry Fruit Fly.**—*Rural New Yorker*, lxxxv, no. 4891, p. 512. New York, 20th March 1926.

Parrott (P. J.). **Controlling Fruit Flies in Cherry Orchards.**—*The Canner*, lxii, no. 1, pp. 23–27, & no. 10, Convention no. pt. 2, pp. 140–143, 1 fig. Chicago, Ill., 26th December 1925 and 27th February 1926.

The information in these papers is all based on the same observations. Under the name cherry fruit-fly the authors include two species, *Rhagoletis fausta*, O.S. (dark-bodied fruit-fly) and *R. cingulata*, Lw. (white-banded fruit-fly). A short account is given of their life-history, which is similar to that recorded in Ontario [*R.A.E.*, A, iii, 293]. The date of emergence of the flies is very variable and must be determined each season by watching, or, better, by traps of cheesecloth over skeleton board framework, placed beneath trees that were infested the previous season. A summary of the control measures has already been noticed [*R.A.E.*, A, xiv, 278]. The adult stage is the only one against which arsenicals can be effectively used, and a spray schedule for use on cherries is given ; this provides for the fruit being well covered with a coating of lead arsenate. Properly timed arsenical sprays are the most satisfactory measures, though, should the first application have been deferred, its action may be hastened by the addition of 1 or 1½ pt. of nicotine sulphate to 100 gals. of the spray, or 2 per cent. nicotine dust to the standard 90–10 sulphur and lead arsenate dust. Such late applications should be made with particular care and a larger amount of material should be used. The adults are also very susceptible to calcium cyanide dust, which may prove useful in such emergency cases.

Compere (H.). **Descriptions of New Coccid-inhabiting Chalcidoid Parasites (Hymenoptera).**—*Univ. California Pubns. Ent.*, iv, no. 1, pp. 1–31, 10 figs., 3 refs. Berkeley, Cal., 1926.

The new species described are : *Coccophagus atratus*, reared from *Ceroplastes* sp. in South Africa ; *Azotus silvestrii*, from *Chrysomphalus aonidum*, L., in China, though possibly parasitic on *Aphelinus diaspidis*, How. ; *Tetrastichus injuriosus*, a hyperparasite of *Saissetia oleae*, Bern., in South Africa ; *Anagyrus aurantifrons*, from *Pseudococcus* sp. in South Africa ; *A. ferrisi*, from *P. crawi*, Coq., in California ; *Pseudleptomastix flatulescens*, from *Erium lichtensioides*, Ckll., in California ; *Aphycus helvolus*, reared from an undetermined host in South Africa and bred on *Saissetia oleae* ; and *Aenasioidea armitagei*, probably a parasite of *Kermes* sp. in California.

Descriptions are also given of both sexes of *Coccophagus malthusi*, Gir., which has been reared from *Ceroplastes* sp. in South Africa, the original description having probably been made from the male ; and of the male of *Coccophagus anthracinus*, Comp.

GRAHAM (S. A.). **Biology and Control of the White-Pine Weevil, *Pissodes strobi*, Peck.**—*Cornell Univ. Agric. Expt. Sta.*, Bull. 449, 32 pp., 14 figs., 44 refs. Ithaca, N.Y., June 1926.

Studies of *Pissodes strobi*, Peck (white-pine weevil), which is one of the most destructive pests of *Pinus strobus* (white pine) and *Picea excelsa* (Norway spruce), have been in progress since 1915 in various parts of the United States, and the data obtained are here collected together.

A list of food-plants is given, the favourite being white pine. The loss of growth resulting from weevil attack on this tree is shown in graphs [*R.A.E.*, A, xii, 324]. There is only one generation a year. The adults emerge in early spring from litter beneath the trees in which they have hibernated and oviposit in the leading shoots. The larvae work downwards, feeding on the inner bark until the shoot is girdled and killed. Sometimes the larvae will pass below the second or even the third whorl of branches, making a single tunnel that may be 30 ins. long. When mature, the larvae pupate in cells in the pith or the wood and emerge as adults in August or September, when they feed for a short time on the new growth and buds and then seek their winter quarters.

Many direct methods of control of the weevil have been tried, but all are expensive and are applicable only in shade and ornamental plantings and private forests. Sprays and washes [*R.A.E.*, A, v, 114] have not proved successful. The best direct method is a combination of collecting adults in the spring and pruning injured leaders in the summer. The method of collection is to jar the beetles from the trees into a net held beneath them. Pruning of injured leaders should be done in June and again in August, or, if only one treatment can be given, in July. Pruning all but one lateral tends to stimulate recovery and is desirable when possible. In timber forests, where indirect methods of control must be practised, white pine should be grown under some shelter-trees that will provide light shade for the young pines until they have reached a height of from 20 to 30 ft. The shade must not, however, be sufficiently heavy to interfere with the growth of the trees. In plantations and old forests of even-age trees, it is found that with an original density of 1,500 trees per acre, or even a standard of 1,200 trees per acre, comparatively little injury will result if a fully-stocked stand is maintained throughout the first 30 years after planting, while in open stands, where the crowns of the trees are all free, a far greater degree of infestation occurs. The effect of original density of stands on susceptibility to weevil attack is shown in a graph.

Numbers of larvae are drowned in the resin exuding from the trees in the early stages of attack, and parasites also reduce the numbers considerably. The most important is *Eurytoma pissodis*, Gir., which sometimes destroys as many as 50 per cent. of the weevils. Oviposition may be observed in July, the eggs being deposited in the pupal cells, and the larvae feeding externally on the host, but within the cells, where they pass the winter, pupating in early spring and emerging as adults. Their life during May and June is unknown ; perhaps another generation develops on an alternative host. Predators are also numerous and include the Clerid, *Monophylla* (*Elasmocerus*) *terminata*, Say, and the larvae of the fly, *Lonchaea rufitarsis*, Macq., which is apparently the most important. Poultry are of some use in keeping down the weevils in small plantations.

HASSELMANN (G.). **Observações sobre a biologia de** *Braula coeca.* [Observations on the Biology of *B. coeca.*]—*Bol. Inst. bras. Sciencias,* ii, no. 4, p. 130. Rio de Janeiro, 15th April 1926.

Observations in Brazil show that the bee louse, *Braula coeca,* only parasitises the worker bees, the queens and drones in the same hives being uninfested.

BONDAR (G.). **Novos pormenores sobre a biologia do Arlequim da Matta,** *Acrocinus longimanus.* [New Details on the Biology of *A. longimanus.*]—*Chacaras e Quintaes,* xxxiv, no. 3, pp. 245–247, 1 fig. S. Paulo, 15th September 1926.

Many of the particulars given here on *Acrocinus longimanus* have already been noticed [*R.A.E.,* A, xiv, 239]. This Cerambycid is commonly found in wild fig trees in Brazil and prefers injured trees or those that have been recently cut down.

MUNRO (J. W.). **British Bark-beetles.**—*Forestry Commiss.,* Bull. 8, 77 pp., 10 pls., 32 figs., 4 pp. refs. London, H.M.S.O., 1926. Price 2*s.* 6*d.*

British bark-beetles may be divided into two main groups, the bark-beetles proper and the wood borers or ambrosia beetles. The general biology of the two groups is discussed, and a comparison is drawn between the British and Continental faunas. Though the range of the food-plants of the British species is considerable, none of them, with the exception of *Xyleborus xylographus,* Say (*saxeseni,* Ratz.), attacks both conifers and hardwoods. Thus *Xyloterus* (*Trypodendron*) *lineatum,* Ol., is confined to conifers and *X.* (*T.*) *domesticum,* L., to hardwoods. *Hylesinus* spp. attack ash, and *Hylastes* spp. breed in Scots pine (*Pinus sylvestris*), except *H. cunicularius,* Er., which breeds in spruce (*Picea excelsa*). *Hylurgops* breeds in Scots pine and spruce indifferently. *Myelophilus piniperda,* L., prefers Scots pine, but in its absence will breed in spruce and larch. Several species are restricted in their food-plants, *Xylocleptes bispinus,* Duft., breeding solely in *Clematis vitalba* and *Kissophagus* (*Cissophagus*) *hederae,* Schmt., solely in ivy (*Hedera helix*).

Some species may breed in a different tree or part of the tree to that in which they feed; thus *Myelophilus* breeds in the stems of Scots pine and feeds in the young shoots, and *Hylastes cunicularius* breeds in spruce stumps and roots, but feeds on the roots of various young conifers. A list is given of the bark-beetles, classified according to their food-plants.

As regards the distribution of Scolytids in Britain, which is governed by that of their food-plants, there are two main regions, the southern and the northern; though no sharp division can be drawn between them, it corresponds roughly with latitude 54°. Members of the genus *Scolytus* become rare north of this line; *Hylastes opacus,* Er., is also rare in the northern region and *Ips laricis,* F., is replaced by *I. acuminatus,* Gyll. The southern region is richer in species than the northern, particularly in those living in hardwoods and the ambrosia beetles. The latter are only represented in Scotland by the genus *Xyloterus.* On the other hand, *Myelophilus minor,* Hart., *Scolytus ratzeburgi,* Jans., *Pityogenes quadridens,* Hart., and *P. chalcographus,* L., are so far as is known at present confined to Scotland, though the last-named has occasionally been found in England in imported timber.

In Ireland the bark-beetle fauna is very limited, the genus *Ips* is entirely absent, which, according to Johnson and Halbert (1902), is due to the destruction of the pine forests. These authors further suggest that such pine-weevils and pine-dwelling bark-beetles as do occur have been reintroduced into Ireland from Britain.

There has apparently been a gradual decline of the Scolytid fauna of Britain in the past, but with the advance of afforestation an increase may be expected, when a knowledge of the present distribution and biology cannot fail to be of practical value.

The natural enemies of bark-beetles include predacious and parasitic insects, birds, chiefly woodpeckers and tits, and fungi. The Clerids and Nitidulids are the best known Coleopterous enemies, the former are represented in Britain by *Thanasimus* (*Clerus*) *formicarius*, L., and *T.* (*C.*) *rufipes*, Brahms. The Nitidulids include a number of species belonging to four genera, *Rhizophagus*, *Pityophagus*, *Glischrochilus* and *Epuraea*.

The losses due to extensive bark-beetle outbreaks are twofold, the direct loss arising from the cutting short of the rotation by the destruction of the living trees, and the indirect loss due to the flooding of the market with a specific class of timber, which results in a fall in price. There may also be considerable loss in value of the wood of attacked trees. Apart from the species of *Hylastes*, which are only injurious in young plantations, *Myelophilus piniperda* (pine-shoot beetle) is the most injurious species in Britain.

While steady losses are incurred, there are no extensive outbreaks in Britain comparable with those known in European and American forests. This immunity is probably due to the limited extent of British forests. That considerable losses may occur, however, was proved in recent years, when as a result of extensive felling for war purposes, considerable areas were threatened by *M. piniperda* [*R.A.E.*, A, viii, 378]. In temperate regions almost all the bark-beetle outbreaks have occurred in coniferous forests, partly as a result of their predominance over broad-leaved forests, but also owing to the greater resistance offered by the broad-leaved trees to attack. The importance of this difference in resistance to attack of the conifers and hardwoods is considerable. The hardwoods serve longer as breeding grounds than do the conifers, and the rate of spread of an outbreak is therefore slower in the broad-leaved forests, and as a consequence the Hymenopterous parasites are able to increase in numbers before fresh trees are attacked.

In Britain all bark-beetles show a preference for less vigorous, suppressed and felled trees. Fungus infestation or unsuitable forestry methods may be predisposing causes to attack. The relation of the attack to thinning practices has been too little studied; it requires both entomological and silvicultural knowledge entailing work extending over a period of years in several districts. Although bark-beetles are frequently, and probably normally, secondary pests, following such injurious agencies as drought, fire, leaf-eating insects, etc., they may, aided by such agencies, and by sheer force of numbers, become primarily injurious, invading vigorous trees over large areas.

The preference shown by bark-beetles for felled trees and those of low vitality, from whatever cause, is the most important feature of their economy from the forester's point of view. Mixed stands of conifers and hardwoods are less subject to extensive outbreaks than pure ones.

Forest utilisation is not highly developed in Britain, and the disposal of slash therefore requires consideration; the importance of this, however, varies according to climatic and forest conditions. The twisted tops and gnarled branches left after felling are particularly important from this point of view; they should be barked or burnt, the work being done before the end of May in England and the end of June in Scotland, where felling is done in winter, and before August where felling is done in summer.

Other remedial measures discussed are the removal of likely breeding grounds where possible, the use of trap trunks, either felled or standing, and the use of parasitic and predacious enemies.

Special measures are dealt with under the individual species, a list of which is given with notes on their distribution and life-history. The general structure and classification of the bark-beetles are discussed, with keys to the genera and species.

The Furniture Mite.—*Brit. Mus.* (*Nat. Hist.*), Econ. Leaflet no. 2, 4 pp., 3 figs. London, November 1925. [Recd. October 1926.]

Glyciphagus domesticus, DeG. (furniture mite) is a troublesome pest in houses and furniture stores, generally appearing with new or newly upholstered furniture. It feeds on all kinds of dried vegetable and animal matter that is not too hard and is frequently found in larders and pantries and in rooms that are slightly damp. The body of the mite is furnished with rather long hairs and well-developed legs, but it sometimes changes into a cell-like structure with no trace of limbs, and in this stage it is very difficult to deal with. The best way to avoid infestation is to refrain from buying furniture stuffed with Algerian fibre, as this is very liable to be infested. Rooms in which the mite has been observed should be kept dry by using fires or oil stoves. To kill the mites as they emerge from the eggs and the cell-like stage, fumigation should be thoroughly practised at intervals of a few days, using about 1 lb. sulphur per 1,000 cu. ft. of space, and observing the usual precautions. Carpets and rugs should be taken out and well beaten; floors and woodwork are best treated with carbolic solution.

Cotton waste containing seeds is also bad material for stuffing furniture owing to the frequent presence in it of *Tyroglyphus longior*, Gerv. (cheese mite), and *T.* (*Aleurobius*) *farinae*, L. (grain mite).

ESCHERICH (K.). **Die Entwicklung der angewandten Entomologie in Deutschland.** [The Development of Applied Entomology in Germany.]—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 29–37. 1926.

This is a historical survey of the development of applied entomology in Germany during the past twenty years. In the subsequent discussion J. Jablonowski pointed out that pest control is essentially a matter for the landowner and that education in applied entomology is an important factor, the rôle of government authorities being a secondary one.

PRELL (H.). **Die Polyederkrankheiten der Insekten.** [The Polyhedral Diseases of Insects.]—*Verh. III. Ent.-Kongr. Zürich 1925*, ii, pp. 145–168. 1926.

An account is given of the results obtained in investigations on polyhedral diseases of insects, chiefly in connection with the outbreaks of the nun moth [*Lymantria monacha*] in Central Europe during the past ten years.

KÉLER (S.). **Ein Versuch der Anwendung mathematisch-statistischer Methoden auf die entomologische Systematick mit Beschreibung einer neuen Borkenkäfer-Art** *Ips fejferi* **und Bemerkungen über** *Ips erosus*. [An Attempt to apply mathematical and statistical Methods in systematic Entomology, with a Description of a new Bark-beetle, *I. fejferi*, and Notes on *I. erosus*.]—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 169–170. 1926.

This is a summary of a paper already noticed [*R.A.E.*, A, xiii, 596].

HERING (M.). **Die Oligophagie der blattminierenden Insekten in ihrer Bedeutung für die Klärung phyto-phyletischer Probleme.** [Oligophagy in Leaf-mining Insects in its Significance for the Solution of phyto-phylogenetic Problems.]—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 216–230. 1926.

This subject has been dealt with in a paper already noticed [*R.A.E.*, A, xiii, 101].

MONZEN (K.). **The Woolly Apple Aphis** (*Eriosoma lanigera* **Hausm.) in Japan, with special Reference to its Life-history and the Susceptibility of the Host-plant.**—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 249–275, 2 figs., 80 refs. 1926.

Hitherto little has been known of *Eriosoma lanigerum*, Hausm., in Japan, where it is the most serious apple pest. After summarising the facts already known about it, the author records his own observations at Morioka (43° north latitude).

In April 1919, hibernated apterous viviparae were placed on apple seedlings in outdoor breeding-cages. There seem to be two wingless viviparous generations a month, or about ten during the season. The young produced by the 7th and 8th generations seem to go into hibernation early in November and to produce young early in May. The latter can travel about four yards in two hours, and are found in movement on the trunk, branches and twigs. They suck the young green twigs, especially the leaf axils. On the branches or trunk they prefer the scars or the crevices produced by the Aphid colonies or the wounds made in pruning. Maturity is reached after four moults, but some individuals produce young after the third moult and afterwards moult again. From birth to reproduction, 8–20 days were required, with an average of 14·3. The productive period was 2–38 days, with an average of 15·6. The total life was 18–50 days, with an average of 31·6. Two hibernated individuals produced 89 and 77 young respectively, and the average number of offspring of individuals that lived their full life was 118·4. The young Aphids hibernate in scars, crevices, or rough bark, and between the swellings produced by this Aphid in the preceding summer. In Japan, hibernation seldom occurs on the root.

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The autumn migrants are abundant on apple from the end of September to the end of October. Many were found on elm trees (*Ulmus campestris*) about 300 yards away from apple trees. In October these elms are covered with autumn migrants of *Eriosoma ulmi japonica*, Mats., and *Tetraneura ulmi japonica*, Mats. Autumn migrants of *E. lanigerum*, under outdoor conditions, give birth to sexuales in the crevices of the bark of the elm, and the resulting females deposit eggs there, each female laying only a single egg. Brief descriptions of the autumn migrants and their progeny are given. The sexual reproduction of *E. lanigerum* may apparently take place in Japan on elm (*U. campestris*). Becker has stated that even in America this Aphid establishes itself only under peculiarly favourable conditions on its primary food-plant, *U. americana*; but *U. campestris* seems to be more suitable, and the migrations from elm to apple and from apple to elm may have gradually developed in Japan.

As regards the varietal susceptibility of apple to the attack of *E. lanigerum*, details are given of the number of young of the apterous viviparae on different varieties of apple, and the fecundity for a definite period on such varieties. *E. lanigerum* is less prolific and shorter lived when fed on some cultivated varieties of apple. Of the grafting stocks, *Pyrus prunifolia* is immune from attack, but *P. sieboldi* (*toringo*) is susceptible. The author suggests that there seems to be some specific ingredient in the cell-sap of immune apples. Analysis showed that the sap of an immune variety contained more acid than that of a susceptible variety, and working from this basis the hydrogen-ion content of the sap of several apple branches and their grafting stocks was investigated in 1923. The tabulated results lead to the conclusion that susceptible varieties of cultivated apple have greater pH values than immune ones, and the same applies in the case of *P. sieboldi* and *P. prunifolia*. To test the question whether this pest can be combated by manuring with acid fertilisers, a series of experiments were made, and the author concludes that they have some value.

FREMLIN (H. S.). **The Necessity for More General Education in Entomology.**—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 344–351, 14 refs. 1926.

This paper gives instances of the influence of insects on animal and vegetable life in support of the plea for the more general teaching of entomology.

JABLONOWSKI (J.). **Ursachen des besonders grossen Rübenkäfer-** (*Cleonus punctiventris* **Germ.**) **Schäden in Ungarn.** [The Causes of the peculiarly severe Injuries in Hungary by the Beet Beetle, *Bothynoderes punctiventris*.]—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 367–376, 2 figs. 1926.

In Hungary the damage done by the weevil, *Bothynoderes* (*Cleonus*) *punctiventris*, Germ., coincided with the development of sugar-beet cultivation, and at the end of the eighties of the past century and in the early nineties beet growing seemed impossible. A careful study of all the factors led to the pest being completely controlled until 1914, since when the losses have become very similar to those previously experienced, owing to the war and its consequences. An account is given of the various measures adopted against this pest.

JABLONOWSKI (J.). **Ungarns Heuschreckengefahr einst und jetzt: eine entomologische-biologische Skizze.** [Hungary's Locust Danger once and now: an entomo-biological Sketch.]—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 377–388, 2 figs. 1926.

In Hungary the disappearance of the migratory locust, *Locusta migratoria*, L., coincided with the appearance of *Dociostaurus maroccanus*, Thunb., both events being due to changes in soil surface and in flora owing to the drainage and other measures carried out in the seventies of the past century. This appearance and development of a local fauna is also seen in the presence of bark-beetles that attack trees that have withered owing to the fall in the level of sub-soil water.

DE LA ESCALERA (F. M.). **Un nuevo Ensayo para combatir en Argelia la plaga de** *Lymantria dispar* **(Lep.).** [A new Attempt to combat *Porthetria dispar* in Algeria.]—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 414–416. 1926.

With a view to combating *Porthetria* (*Lymantria*) *dispar* in Algeria natural enemies of this moth have been dispatched from Spain, part of the journey being covered by aeroplane. From 7th May to 30th June 1925, there were sent 3,500 specimens of the Silphid beetle, *Xylodrepa quadripunctata*, 4,000 of the Carabid, *Calosoma inquisitor*, and 3,300 pupae of *Apanteles*. In Spain *X. quadripunctata* preys on the newly hatched larvae of *P. dispar*; *C. inquisitor* appears 8–10 days later, and about a month later *C. sycophanta* attacks the full grown larvae and pupae. *C. sycophanta* already occurs in North Africa.

DAVIDSON (J.). **The sexual and parthenogenetic Generations of the Life-cycle of** *Aphis rumicis*, **L.**—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 452–457. 1926.

The black bean aphis, *Aphis rumicis*, L., was reared experimentally in England for four years on *Vicia faba*, with *Euonymus europaeus* as the winter food-plant. Ova were produced in October 1920 and 1921, and in April and November 1923 and October 1924 on *Euonymus*, and in December 1922 and April 1923 on the beans. Fundatrices hatched on *Euonymus* in March 1921, 1922 and 1924 and April 1925. Apterous viviparae were obtained throughout the year. In the summer generations these apterous forms produced either only apterous individuals or a mixed colony of apterous and alate viviparae. The latter occurred practically throughout the year. In summer they produced apterous viviparae, but in winter many produced sexual females and many died without reproducing. Males are produced by apterous sexuparae, and the same mother may produce males, alate viviparous sexuparae and one or two apterous viviparae. Males were observed on *Vicia* and *Euonymus*. Oviparous females were produced by alate viviparous sexuparae. In winter many of the winged forms produced only sexual females, while a number died without reproducing. All the possibilities of sexual females being produced have not been investigated. They occurred on both *Vicia* and *Euonymus*. Temperature is an important factor affecting the proportion of parthenogenetic individuals produced during the winter months, and in colonies carried on from November to January under greenhouse conditions the great majority of individuals produced were apterous viviparae.

TRÄGÅRDH (I.). **On Some Methods of Research in Forest Entomology.**—*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 577–592, 10 figs., 1 pl. 1926.

This paper describes a method of entomological analysis of trees already noticed [*R.A.E.*, A, xiii, 608].

BLEDOWSKI (R.) & KRAINSKA (M. K.). **Ueber die Entwickelung von** *Banchus femoralis* **Thoms.** [On the Development of *B. femoralis*.] —*Verh. III. Internat. Ent.-Kongr. Zürich 1925*, ii, pp. 642–643. 1926.

This is a summary of a paper already noticed [*R.A.E.*, A, xiv, 137].

KING (C. B. R.). **Some Notes on the Red (Sudan) Bollworm** (*Diparopsis castanea*, **Hampson) in Nyasaland.**—*Empire Cotton Growing Rev.*, iii, no. 4, pp. 352–364, 1 pl., 1 fig. London, October 1926.

Diparopsis castanea, Hamps. (Sudan or red bollworm) has been known in Nyasaland at least since 1911, and the present situation is serious, as the moth has adapted itself entirely to cotton where this crop is grown year after year on the same land. Sowing of cotton begins with the first planting rains ; flowering begins nine or ten weeks after sowing, and the first bolls open in April or May. There is generally a second crop that matures in September and October, and this usually gives a good yield, but the first crop is often so badly damaged that there is nothing to pick.

The various stages of this Noctuid are described. Within a few days after the flower buds appear, eggs begin to be deposited, chiefly on the leaves, main stem and petioles, and generally singly, though sometimes in pairs. After several days the larvae hatch, and make their way to the buds, which they enter where one of the bracts touches the bud. One larva may destroy several buds in succession, and the attack is at once evident, as the bract flares back, and later the buds are shed. The larva generally attains maturity in from 4 to 6 weeks, though some are mature after 2 weeks, and then descends to the soil, burrowing down a little distance for pupation. The period spent in the pupal stage is very variable, lasting from less than a month to more than ten months, and being generally much longer in the later part of the season ; all the factors affecting this variability are not known ; it may be due to the availability of cotton for as long as eight months in the year, whereas a natural food-plant would probably only be fruiting for about two months. A small second generation occurs in April or May. No wild food-plant has yet been found in Africa. Another moth, not yet identified, but with eggs and larvae very similar to those of *D. castanea*, attacks *Thespesia rogersi* with much the same effect and has a regular pupal duration of about nine months. This is apparently its only food-plant, and fruits for about two months early in the year. This species has been bred experimentally upon cotton from its earliest stage, but has not yet been known to attack cotton in nature.

The emergence of the adults of *D. castanea* takes place in warm, moist weather, and is generally at its maximum in February and March. Oviposition continues for about 6 or 8 weeks, during which time the female is probably fertilised more than once and may deposit about 1,000 eggs. The moths are evidently attracted under certain conditions to light, though acetylene light traps in the field have not attracted them. Only two Tachinids and a number of Phorids were reared from the larvae by the author, and no egg parasites were found. A form of bacterial boll-rot apparently kills numbers of the larvae, and pupae may be killed by a fungus. The Pentatomid, *Macrorhaphis spurcata*, Wlk., is predacious on this pest, though it probably has not much effect on its numbers.

The method of control hitherto recommended has been the removal of all flared bolls, but this can only be done after the attack has been made and is difficult to carry out as the season advances. The best remedy is to prevent oviposition by hand collection of the moths before eggs are laid. This can be done by native labour, the best time to start being about four weeks after planting the cotton. The work can be made more effective by planting only a small area with cotton, and following it by another crop in the following year, planting cotton as far away as possible and continuing to collect any moths appearing on the area lately under cotton. A close season is necessary so that those moths that emerge with the first rains have nowhere to oviposit. Thorough cultivation will destroy numbers of the pupae.

An appendix gives a list of the cotton pests in Nyasaland in 1926.

BALLARD (E.). **Sixth Entomological Progress Report (Australia) Season 1925-1926 continued.**—*Empire Cotton Growing Rev.*, iii, no. 4, pp. 365–373. London, October 1926.

All evidence points to the fact that *Heliothis obsoleta* and *Dysdercus sidae* are the two principal pests of cotton in Australia. Oviposition of *H. obsoleta* lasts from October to April, at least 500 eggs being laid by one female. The stages in Brisbane were found to average 2½ to 3 days for the egg, 12½ to 25 days (during December and January) for the larva, and 12 to 15 days for the pupa ; the maximum numbers occur in January and February. In normal years natural enemies reduce this moth to negligible numbers after March. Hibernation probably begins behind the coastal ranges early in May ; on the coast there is probably no hibernation at all. In very hot, dry seasons, parasitism is much reduced, and infestation is consequently heavier. Early planting will do much to obviate loss from *H. obsoleta* ; if the maximum square-setting period precedes the maximum numbers of the insect, the crop will escape serious injury, but late planted cotton will practically always suffer because the squares are removed as they are formed, and the maximum bud period coincides with the maximum numbers of *H. obsoleta*. The use of a trap crop of maize was completely successful in 1925 [*R.A.E.*, A, xiv, 386], but this method will probably be abandoned in view of the fact that calcium arsenate dust has proved a very efficient remedy against the wandering larvae. This treatment should not be necessary before the end of December, and two applications at an interval of 14 days should be sufficient. The moths live 14 or 15 days and begin oviposition three days after emergence ; therefore insects that as larvae had burrowed the night before the first dusting would be ovipositing on the night after the second. This system of dusting should dispose of the majority of the larvae present, as very few of those from eggs laid between the two dustings should survive. The maximum amount of dilution that can be combined with maximum toxic effect requires to be found.

Dysdercus sidae, probably owing to excessively unfavourable weather conditions, was not present in sufficient numbers for satisfactory studies to be carried out, but one outstanding discovery was the absolute dependence of this bug on moisture. Investigations are still in progress; baits, which promised to give good results last year, proved this year to be a failure.

Minor cotton pests include *Oxycarenus luctuosus*, which damages the seed, but cannot apparently be economically controlled in Queensland; the best method of circumventing it is to increase the seed rate and ensure a good stand. *Dichocrocis* (*Conogethes*) *punctiferalis* is only a serious pest in late-planted cotton. Slight damage was done by *Earias huegeli* and *Crocidosema plebeiana*, and there were sporadic outbreaks of *Euxoa radians*, *Prodenia* sp. and *Tetranychus telarius*. Pink bollworm [*Platyedra gossypiella*] was very seldom encountered.

TEODORO (G.). **Mosche e pebrina.** [Flies and Pebrine.]—*Ann. d'Igiene*, xxxvi, no. 8, pp. 585–587, 3 refs. Rome, August 1926.

Experiments on the possible transmission of the causal organism of pebrine in Lepidoptera by flies, particularly *Musca domestica*, show that they can carry the disease not only on the external parts of their bodies, but also by ingestion, the organisms being regurgitated or excreted. This may occur three days after ingestion.

PALM (B. T.). **Verslag** [Report] **van het Deli Proefstation over 1 Januari 1925–31 December 1925.**—*Meded. Deli Proefst.*, 2nd Ser., no. 42, 35 pp. Medan, Sumatra, 1926.

In the report of the zoologist, Dr. Fulmek, it is stated that of several native preparations against *Myzus persicae* on tobacco, derris was found to be the best. The soap in derris sprays was reduced to 2 per mille, as otherwise the leaves are injured if any traces of an arsenical spray is present. Nicotine sulphate proved effective at the rate of 3 per mille nicotine plus 2½ per mille soap, but is dearer than derris. The soap in lead arsenate sprays against caterpillars, such as those of *Phytometra* (*Plusia*), was reduced to 2 or even 1 per mille without disadvantage. In one case the caterpillars of *Tiracola plagiata* defoliated woods of *Trema amboinensis* and then attacked seed-beds and newly planted tobacco. A caterpillar, probably of a Syntomid, appears to be a new pest of tobacco; it bores in the stems of plants newly put in the field.

ARISZ (W. H.). **Verslag over het jaar 1925.** [Report on the Besoeki Experiment Station for 1925.]—*Meded. Besoekisch Proefst.*, no. 41, 58 pp. Djember, 1926.

Ground on which the growth of tobacco seedlings was irregular was found to be infested with Nematodes. They were much less numerous in beds treated with calcium cyanamide (about 40 oz. to 48 sq. ft.), but growth remained irregular. This material also did not appear to be effective in experiments against larvae of a beetle, *Opatrum* (*Gonocephalum*) sp., which is a very serious pest in tobacco seed-beds.

FERRIÈRE (C.). **Descriptions de deux nouveaux Hyménoptères parasites obtenus par le Dr. R. Menzel de la punaise du thé** (*Helopeltis antonii* **Sign.).**—*Treubia*, vi, no. 3–4, pp. 455–458, 2 figs. Buitenzorg, December 1925.

A Braconid, *Euphorus helopeltidis*, sp. n., and an Ichneumonid, *Stictopisthus javensis*, sp. n., are described from Java, where the former parasitises the tea Capsid, *Helopeltis antonii*, Sign., and is itself parasitised by *S. javensis*.

VAN HARREVELD (P.). **Parasieten van de witte luis.** [Parasites of *Oregma lanigera*.]—*Arch. Suikerind. Ned.-Indië; & Meded. Proefst. Java- Suikerind.*, 1926, no. 12, pp. 373–377. Pasoeroean, 1926.

This is a brief account of the investigations conducted in 1925 in Java by M. Ishida, entomologist of the Sugar Experiment Station in Formosa, on parasites of the white woolly sugar-cane aphis, *Oregma lanigera*, Zehnt., a full report of which is noticed below. Two attempts to convey *Encarsia flavoscutellum*, Zehnt., a Chalcid parasite of *O. lanigera*, to Formosa have failed owing to the short life of the adults, and a third is being made.

ISHIDA (M.). *Oregma lanigera* **(witte wolluis) en hare parasieten.**—*Arch. Suikerind. Ned.-Indië; & Meded. Proefst. Java-Suikerind*, 1926, no. 13, pp. 379–401. Pasoeroean, 1926.

The white woolly aphis, *Oregma lanigera*, Zehnt., is an important pest of sugar-cane in the East, especially in French Indo-China and Formosa, and an attempt has been made to find natural enemies of it in South China, the Philippines, Indo-China and Java. Those recorded in Formosa are a Coccinellid, *Synonycha grandis*, Thunb., a Syrphid fly, *Dedeopsis aegrotus*, F., and a moth [called *Ephestia cautella* in this paper though this identification is stated in an editorial footnote to be incorrect]. Two Coccinellids that prey on *O. lanigera* were found in Indo-China and were introduced into Formosa; one of these, *Coelophora biplagiata*, Swartz, was taken from Formosa to Java in April 1926, and is being distributed there.

O. lanigera, which reproduces parthenogenetically, no males being known, was found to be a less serious pest in Java than in Formosa, a Chalcid parasite, *Encarsia flavoscutellum*, Zehnt., being abundant. This was the only parasite found. Two predacious enemies occur; the Syrphid, *D. aegrotus*, and the moth referred to above. Of one batch of 2,120 Aphids examined, 43·9 per cent. were parasitised, this being the maximum observed, the minimum being 4·6 per cent. Of 2,500 individuals of *E. flavoscutellum* 62·5 per cent. were females. The average life of the adult female is 5–6 days and that of the male 3–4 days. Development from egg to adult requires 8–9 days, the egg-stage lasting one day, the larval stage 5–6, and the pupal stage 2–3. The female produces about 100 eggs and oviposits in the Aphid.

van Breemen (P. J.). **De aantasting van de witte luis** (*Oregma lanigera*, **Zehnt.**) **door de parasiet** *Encarsia flavoscutellum*, **Zehnt.** [The Attack on the White Aphis, *O. lanigera*, by the Parasite, *E. flavoscutellum.*]—*Arch. Suikerind. Ned.-Indië ; & Meded. Proefst. Java-Suikerind.*, 1926, no. 14, pp. 404–409, 2 figs. Pasoeroean, 1926.

This paper describes the method of parasitism of the Aphid, *Oregma lanigera*, Zehnt., by the Chalcid, *Encarsia flavoscutellum*, Zehnt., and discusses means of detecting the presence of the parasites in their host.

van Breemen (P. J.). **Eenige waarnemingen omtrent het zwermen van** *Aphis maidis* **Fitch.** [Some Observations on the Swarming of *A. maidis.*]—*Arch. Suikerind. Ned.-Indië ; & Meded. Proefst. Java-Suikerind.*, 1926, no. 18, pp. 513-543. Pasoeroean, 1926.

Though *Aphis maidis*, Fitch, is the only insect known to transmit mosaic diseases of sugar-cane, in many cases there has been no connection between the amount of the injury and the abundance of the Aphid. To ascertain when the Aphids were on the wing in the cane-fields, screens of tracing paper or tracing cloth, fastened to wooden frames and smeared with vaseline on both surfaces, were used. The catches are described, and the results of 18 months' observations show that winged individuals occur at all seasons of the year, but that they suddenly increase in the rainy season, when for a period of some weeks noticeable flights occur in places where their presence would not be expected. *A. maidis* seems to form colonies only on young cane in the field, and such colonies seem to disappear gradually as the cane grows older. Wind does not seem to influence the general course of the flights. Attention must always be directed to the winged individuals in searching for a connection between the amount of mosaic disease not due to slips and the numbers of *A. maidis*.

Karny (H. H.). **Beiträge zur malayischen Thysanopterenfauna. ix. Ueber Puppenkokons von** *Anaphothrips*. [Contributions to the Malayan Thysanopterous Fauna. ix. The nymphal Cocoons of *Anaphothrips.*]—*Treubia*, ix, no. 1–2, pp. 6–10, 1 pl. Buitenzorg, August 1926.

Nymphs of *Anaphothrips* sp. have been found on the edges of curled tea leaves in Java. The situation in which the nymphs of this genus occur was not previously known, and the discovery is of importance as it shows that they would be completely sheltered from sprays.

Silvestri (F.). **Descrizione di tre specie di** *Prospaltella* **e di una di** *Encarsia* (**Hym. Chalcididae**) **parassite di** *Aleurocanthus* (**Aleyrodidae**).—*Eos*, ii, no. 2-3, pp. 179–189, 4 figs. Madrid, 28th September 1926.

Descriptions are given of the Chalcids, *Prospaltella smithi*, sp. n., from *Aleurocanthus spiniferus*, Q. & B., in China and from *A. woglumi*, Q. & B., in Ceylon ; *P. ishii*, sp. n., from *A. spiniferus* in China ; and *P. divergens*, sp. n., and *Encarsia merceti*, sp. n., from *A. woglumi* in Singapore. The Aleurodids occurred on *Citrus*.

RAMAKRISHNA AIYAR (T. V.). **Recent Additions to the Indo-Ceylonese Coccid Fauna, with Notes on known and new Forms.**—*Jl. Bombay Nat. Hist. Soc.*, xxxi, no. 2, pp. 450–457. Madras, 15th August 1926.

This paper forms a supplement to the author's check list of the Indo-Ceylonese Coccids [*R.A.E.*, A, x, 183] and includes all forms recorded since then.

TAKAHASHI (R.). **The Life-history of** *Macrosiphum formosanum*, **Takah.** [*In Japanese.*]—*Trans. Nat. Hist. Soc. Formosa*, xvi, no. 86, pp. 184–192. Taihoku, Formosa, October 1926.

Macrosiphum formosanum, Tak., is one of the commonest Aphids in Formosa, where it is viviparous throughout the year, feeding on various species of *Sonchus* and *Lactuca*, of which *S. oleraceus* is the most favoured. This Aphid is positively thigmotropic, especially as a young nymph, and the habit of dropping to the ground when disturbed, which is common in Aphids of this genus, is absent in this stage. The nymphs scarcely move about on the food-plant, but the apterous adults sometimes migrate from one position to another. The adults live about 27 days on an average, during which period one female, whether winged or wingless, produces 48 young on an average and up to seven a day. Young are produced in 1 to 5 days after the last moult, according to the temperature. The nymphal stage also varies with the temperature, lasting 5–16 days, with an average of 6–7. Near Taihoku there may be as many as 30 generations a year. Of the individuals reared by the author, 13·8 per cent. were winged forms.

TOYOSHIMA (A.). **On an** *Anthonomus* (**Curculionidae**), **a Pest of the Cherry.** [*In Japanese.*]—*Jl. Plant Prot.*, xiii, no. 9, pp. 549–550, 1 pl. Tokyo, September 1926.

The larvae of *Anthonomus bifasciatus*, Mats., feed in cherry stones, from which the adults emerge at the end of September in the Aomori prefecture. A description is given of the adult.

UCHIDA (T.). **Erster Beitrag zur Ichneumoniden Japans.** [First Contribution on the Ichneumonids of Japan.]—*Jl. Coll. Agric. Hokkaido Imp. Univ.*, xviii, no. 2, pp. 43–173, 19 figs., 5 pls., 65 refs. Sapporo, August 1926.

Hitherto about 95 species of ICHNEUMONIDAE have been recorded from Japan. This paper deals with 221 species and 19 varieties, of which 90 species and 12 varieties are described as new. Seven new genera have been erected. Keys to the subfamilies, genera and species are given.

ACQUA (C.). **Le mosche e la trasmissione della pebrina.** [Flies and the Transmission of Pebrine.]—*Boll. R. Staz. sperim. Gelsic. e Bachic.*, v, no. 4, pp. 134–136. Ascoli Piceno, August 1926.

The hitherto unpublished results of experiments made by the author in 1923 and 1924 confirm those of Teodoro, that flies can transmit pebrine [*R.A.E.*, A, xiv, 590].

LAING (F.). **The alate Female of the Auricula Aphid.**—*Ent. Mo. Mag.*, lxii, pp. 211–212, 1 fig. London, September 1926.

The alate viviparous female of this Aphid is described from Surrey on *Primula pedemontana*. As its correct name is still in doubt, it is for convenience treated as *Pentaphis auriculae*, Murray.

THEOBALD (F. V.). **The Diamond Back Moth** (*Plutella maculipennis*).—*Jl. Kent Farmers' Union*, xx, no. 3, reprint, 7 pp., 1 fig. Maidstone, September 1926.

Plutella maculipennis, Curt. (diamond-back moth) is always present to a certain extent in Britain and in certain years causes serious losses. Earlier records in this country are briefly reviewed. In 1926 the pest was abundant in Kent, particularly on the coast of Thanet and also in some localities inland, many acres of swedes having to be resown, while other crucifers, both wild and cultivated, were also seriously injured. A good deal of the information given in this paper has previously been noticed [*R.A.E.*, A, xii, 283]. There are at least two generations a year in Britain and sometimes three, the first moths appearing in May and June and ovipositing on cruciferous weeds, the second generation ovipositing in July on cultivated crucifers, and hibernating as pupae. One female may deposit from 70 to 100 eggs, which hatch in 7–10 days; the larval stage lasts from 16 to 24 days. The best remedy is to brush as many as possible of the larvae off the plants by mechanical means (such as boughs attached to a horse hoe) and follow this treatment with a nicotine or lead arsenate spray or dust. A home-made pyrethrum spray has also given promising results.

JAMES (H. C.). **The Anatomy of a British Phytophagous Chalcidoid of the Genus** *Harmolita* (*Isosoma*).—*Proc. Zool. Soc. London*, 1926, pt. 1, pp. 75–182, 68 figs., 193 refs. London, April 1926.

This morphological study of the Eurytomid, *Harmolita graminicola*, Giraud, is intended as a basis for future work. With the exception of those occurring in Russia, very little is known of the biology of the European species of *Harmolita*, though many have been found to be serious pests of cereals and cultivated grasses. *H. graminicola* forms galls on the culms of couch-grass (*Agropyrum repens*) and has a fairly wide distribution in England. The genus is also of scientific interest, owing to the change of diet which the larvae of some of its members undergo during development, and which is considered by some writers to have a phylogenetic significance.

The present study shows the divergencies of structure existing between phytophagous Chalcidoids and those possessing the parasitic habit. The internal and external anatomy of the adult female of *H. graminicola* are described in considerable detail, and in general those parts of the male that differ from the corresponding parts of the female have also been dealt with.

THEOBALD (F. V.). **Notes on some unusual Insect Pests on Fruit.**—*Jl. Pomology & Hortic. Sci.*, v, no. 4, pp. 241–247, 6 figs. London, October 1926.

The larvae of *Mania maura* (old lady moth), which is commonly found in England, particularly along the Thames Valley, are recorded as eating off the shoots and buds and the bark from the shoots of plums, peaches and nectarines. This species, the stages of which are described, is polyphagous, and only occasionally attacks fruit trees. The moths are sometimes attracted to lights and shelter in dark places by day. The female oviposits in late summer and autumn, usually on fruit trees; the eggs hatch in autumn and the larvae enter the soil and hibernate, but may, as in the present case, feed at times during the winter, emerging from the soil at night only. In the spring, they remain above ground and feed on the leaves, but the chief damage done is to the buds, shoots and wood in late autumn and winter. Larvae kept in the insectary continued feeding until May, when they descended to the soil for pupation. Pear trees are sometimes attacked, but apple and cherry only in the absence of other food. Numbers of the larvae can be killed by prong-hoeing round the stems of the trees during the day, and crushing those that remain exposed but undamaged.

The earwig, *Forficula auricularia*, was observed to eat out the unopened blossoms and buds of plums. On some young trees up to 90 per cent. of the buds were damaged and showed scarcely any blossom. The old established trees were not much affected. The earwigs were found in numbers sheltering under the bands of sacking round the trees, and the damage can easily be checked by untying the bands and holding beneath them a circular piece of cardboard made into a funnel and smeared inside with adhesive, in which most of the insects can be caught.

Two species of thrips, *Thrips tabaci* and *T. flavus*, caused serious loss in a plantation of American blackberries, about 50 per cent. of the blossoms and young fruitlets being destroyed. A small proportion of the damage was due to *Byturus tomentosus* (raspberry beetle) and to the gall midge, *Contarinia rubicola*. Both larvae and adults of these thrips feed in the blossoms, and eggs are laid in the petioles. The nymphal stage is passed in the soil. *T. adusta* was also present, and small numbers of *Limothrips cerealium*. *T. tabaci* and *T. flavus* evidently pass the winter in the adult stage, and were first observed on blackberries in June, the chief attack coming from the second generation in August and early September. They were found in numbers in wild blackberry blossoms in the neighbourhood, and occasionally in loganberries, but not in raspberries. Spraying is useless, as the thrips are hidden in the buds and flowers, and would only be dangerous to bees. Poultry allowed to run in the plantation ate the adult thrips as they escaped from the soil, and succeeded in clearing up the infestation in question, which, however, continued in the neighbouring wild blackberries.

GREEN (E. E.). **Observations on British Coccidae. x.**—*Ent. Mo. Mag.*, lxii, pp. 172–183, 7 figs. London, 1926.

The species dealt with include *Icerya purchasi*, Mask., observed on the foliage of *Pittosporum* under glass and said to have been imported from France two years previously; this is the first record of this Coccid in the British Isles, and the infested plants have since been destroyed. It is pointed out that the species previously described as *Kuwania pini*, Green [*R.A.E.*, A, xiii, 162], should be referred to the genus *Matsucoccus*.

New species described are *Phenacoccus nudus*, on grasses in Surrey; *Rhizoccus elongatus*, on the roots of a species of *Phyllocactus* in Hampshire; *R. dianthi*, on roots of *Dianthus plumarius* and *D. barbatus* in Surrey; *R. decoratus*, on roots of *Abutilon*, in Yorkshire; and *Luzulaspis scotica*, on grasses in Scotland. The genus *Rhizoecus* is re-described, and the characters differentiating it from *Ripersia* are discussed. Notes are given on *Aspidiotus* (*Selenaspidus*) *pumilus*, Brain, *Chionaspis exalbida*, Ckll., *C. salicis*, L., and *Aulacaspis rosae*, Bch., and some locality records of British Coccids are appended.

GOODWIN (W.) & MARTIN (H.). **An Investigation of the Chemical Changes taking place in the Mixed Lime sulphur—Lead arsenate Spray.**—*Jl. Agric. Sci.*, xv, pt. 3, pp. 307–326, 24 refs. Cambridge, July 1925.

For the purpose of these experiments, commercial preparations of lime-sulphur such as are used in general field work were employed. The lead arsenate was in the form of commercial pastes (not always the same one), but all had been proved by analysis to consist mainly of acid arsenate. This was chosen because basic or neutral lead arsenate is not used to any extent in England and is generally believed to have a smaller toxic effect. The methods of analysis used throughout are described in detail, some modifications of recognised or official methods being found necessary. The following is the authors' summary of the results:—

The reaction between lime-sulphur and acid lead arsenate is shown to be small and to have little effect on the chemical properties of either material as a spray. It is shown that the oxidation of lime-sulphur proceeds according to the empirical formula: $CaS.\ S_x+3O=CaS_2O_3+S_{x-1}$, and that the calcium sulphides are hydrolysed in aqueous solution. The addition of lead arsenate has no effect on the amount of sulphur precipitated from the lime-sulphur by oxidation or by the action of carbon dioxide. Lead arsenate is only slightly decomposed by lime-sulphur or by the oxidation products of lime-sulphur, the main decomposition being due to the action of sulphuretted hydrogen formed by the hydrolysis of the calcium sulphides. This decomposition becomes marked in the presence of carbon dioxide, which reacts on the calcium sulphide to form sulphuretted hydrogen. The fungicidal value of the mixed spray—as judged by the mildew-killing properties of the polysulphides—is not less than that of lime-sulphur alone. Additional fungicidal properties may be expected from the presence in the spray of soluble arsenates and thioarsenates. Judging by the chemical changes that take place in the mixed spray, the insecticidal value of the lead arsenate would not appear to be greatly affected by the addition of lime-sulphur. There is an increased amount of soluble arsenic formed by the action of carbon dioxide on the mixed spray, which may prove sufficient in amount to cause spray injury. The A.O.A.C. method for the determination of sulphate sulphur in lime-sulphur solutions is shown to be inaccurate. A method yielding more concordant results is proposed.

GOODWIN (W.) & MARTIN (H.). **The Chemical Effect of the Addition of a "Spreader" to the Mixed Lime sulphur—Lead arsenate Spray.**—*Jl. Agric. Sci.*, xv, pt. 4, pp. 476–490, 9 refs. Cambridge, October 1925.

As the addition of a spreader to the mixed lime-sulphur and lead arsenate spray is frequently recommended, experiments were carried out with the object of testing the chemical effects of the addition of casein alone and of lime-casein and also of gelatine to this spray. The authors' summary of this paper is as follows: The addition of casein to the mixed lime sulphur—lead arsenate spray [see preceding paper] causes: (*a*) an increase in the amount of soluble arsenic formed on the decomposition of the spray; (*b*) no change in the reactions of the polysulphide sulphur. The addition of lime to the spray: (*a*) decreases the formation of soluble arsenical compounds; (*b*) reduces the fungicidal value of the spray owing to its reaction with the sulphur liberated from the calcium sulphide. The addition of lime-casein to the mixed spray is influenced by the composition of the lime-casein. [In this connection it is mentioned that commercial "calcium caseinates" invariably contain excess of lime.] If much free lime is present: (*a*) the formation of soluble arsenic is dependent on external conditions, which in certain cases tend to decrease the amount of soluble arsenic formed; (*b*) the fungicidal value of the spray is reduced. If slight excess of lime is present, or if the sample has badly carbonated: (*a*) the amount of soluble arsenic is increased; (*b*) there is little effect on the reaction of the polysulphide sulphur. The addition of gelatine to the spray: (*a*) increases the formation of soluble arsenic; (*b*) has no effect on the reaction of the calcium sulphide. The rate of decomposition of the mixed spray is retarded by the addition of casein, lime, lime-casein and gelatine.

GOODWIN (W.) & MARTIN (H.). **The Lime sulphur—Calcium arsenate Spray.**—*Jl. Agric. Sci.*, xvi, pt. 4, pp. 596–606. Cambridge, October 1926. 12 refs.

Supplementary to the investigations noticed above, tests have been made to determine particulars of the changes that take place when calcium arsenate instead of lead arsenate is mixed with lime-sulphur, the methods employed being practically the same as before. Owing to difficulties in preparing pure tricalcium arsenate, it was decided to use only dicalcium arsenate plus lime and commercial calcium arsenates as additions to the lime-sulphur. The authors summarise their inferences as follows: The formation of a stable tricalcium arsenate by precipitation from aqueous solution is improbable. The interaction of calcium hydroxide and dicalcium arsenate results in the formation of a continuous series of basic calcium arsenates, which are hydrolysed in aqueous suspension. Through the formation of such basic calcium arsenates the addition of lime to dicalcium arsenate reduces the amount of arsenic in solution. This reduction is temporary, and on exposure to atmospheric carbon dioxide the original solubility of the dicalcium arsenate is restored. The concentration of soluble arsenic in the dicalcium arsenate-lime spray will not be as great as in the dicalcium arsenate spray, and the risk of spray injury with the dicalcium arsenate spray is therefore reduced when lime is added. The concentration of soluble arsenic in the dicalcium arsenate and lime spray is reduced by the admixture of lime-sulphur, with a corresponding reduction of the risk of foliage injury. The precipitation of sulphur from the calcium polysulphides of the lime-sulphur is unaffected by the addition of dicalcium arsenate. The addition of lime may result in a diminution of the amount of sulphur so precipitated, but such a reaction is dependent on the rate of carbonation of the free lime on the leaf surface. The fungicidal activity due to the calcium polysulphides is therefore unaffected by the addition of dicalcium arsenate, but may be adversely influenced if excess of calcium hydroxide be present.

PAILLOT (A.). **Sur les causes du dépérissement des abricotiers dans la vallée du Rhône.. Rôle du** *Xyleborus saxeseni.—C. R. Acad. Agric. France*, xii, no. 30, pp. 836–840. Paris, 1926.

The reason for the dying off of apricot trees in the Rhône Valley has long been investigated without much success, but recent examination has shown on all the dying trees the presence of *Xyleborus xylophagus*, Say (*saxeseni*, Ratz.), the attacks of which on the wood are considered sufficient to kill the tree. This polyphagous Scolytid is a well-known pest of forest and fruit trees throughout the northern hemisphere, but in the Rhône Valley has only been observed on apricots, even the plum, which frequently forms the grafting-stock of the apricot, being immune. Its galleries are only found in the trunk and at the base of the larger branches of trees not less than 6 or 7 years old ; as a result, the bark dies, starting from the point of grafting of the apricot on to the plum. The presence of *X. xylographus* is difficult to detect, but the point of attack can often be discovered by removing the dead bark, when the galleries can be seen in the outer layers of sapwood. The end of each gallery is much enlarged, forming a sort of nest, in which the adult may be found. Hibernation generally occurs in the adult stage. The white, apodous larvae live on an ambrosia fungus, which lines the galleries. It cannot be definitely stated, after only one year's observations, that *X. xylographus* is the principal cause of the death of apricot trees in the Rhône Valley, but its constant presence in the dying or dead trees indicates that it is probably an important factor in their condition. It is significant that when a branch of apricot is partly dead, it is only in the dead portions that the galleries of *X. xylographus* are found. When a healthy tree is attacked it exudes an abundant secretion of gum at the point of entry, which probably causes the death of many of the beetles ; in such a case, the tree does not show the ordinary signs of dying back, but can easily be distinguished from thoroughly healthy trees. It is possible that such trees are the preferred habitat for the new generation of the pest. The factors tending to predispose the trees to attack require further study. Every effort should be made to check the increase of this pest ; the remedies suggested are the immediate destruction by fire of the trees or parts of the trees that are dying back. This is to be tried in one locality on a large scale and is to be followed by arsenical sprays during the winter.

GUYOT (L.). **Congrès national sur la lutte contre les ennemis des cultures.**—*Jl. Agric. prat.*, xlvi, nos. 41 & 42, pp. 298–300 & 319–320. Paris, 9th & 16th October 1926.

This is a brief review of the subjects under discussion at the first National Conference on Pest Control, organised by the Paris-Lyons-Mediterranean Company, and held at Paris in June 1926, a number of foreign delegates being present. The situation with regard to the principal pests of fruit and other trees in the south of France was discussed, as well as those affecting the French parts of Northern Africa. The difficulty of obtaining sufficient supplies of nicotine for insecticidal purposes was dealt with, and it was suggested that nicotine production in the French Colonies, particularly in Algeria, should be encouraged in every way. Expression was given to the necessity for a proper standardisation of insecticide and fungicide products, as a precaution against fraud. An examination of various types of spraying apparatus now in use clearly demonstrated the need of more specialised adaptation of machinery to the uses of insect control.

JOLYET (A.). **Mesures d'ordre cultural tendant à l'immunisation des forêts contre les insectes nuisibles. Destruction des insectes nuisibles dans les forêts.**—*Vie agric. & rur.*, xxviii, no. 5, pp. 65–69 & xxix, no. 44, pp. 276–281. Paris, 30th January & 30th October 1926.

This is a popular account of methods for the prevention and treatment of insect infestations in forests. With regard to the migrating larvae, particularly those of *Dendrolimus pini*, that are caught in trenches, the author suggests that these should not be destroyed, as is usually done, but that they should be allowed to die of starvation in the trenches so that their parasites may have the opportunity of emerging.

BONNEFOY (J. M.). **Un moyen entomologique de destruction de l'Altise.**—*Prog. agric. & vitic.*, lxxxvi, no. 42, pp. 369–371. Montpellier, 17th October 1926.

The Pentatomid, *Zicrona coerulea*, L., is predacious on larvae of *Haltica ampelophaga*, Guér., on vines in the south of France, where the latter is one of the worst vineyard pests. In captivity, this bug does not eat even the tenderest foliage. Colonies of it might be introduced when the first larvae of *H. ampelophaga* are hatching.

ZACHER (F.). **Schädliche Insekten in Mühlenbetrieben und ihre Bekämpfung.** [Injurious Insects in Flour Mills and their Control.]—*Allgem. Deutschen Mühlen-Ztg.*, 1926, no. 40, reprint, 7 pp., 1 fig. Charlottenburg, 1926.

A short account is given of the insect pests that occur in flour-mills in Germany and of the measures to be used against them.

ZACHER (F.). **Der Khaprakäfer, ein neuer Schädling an Getreide, Malz und Hülsenfrüchten.** [The Khapra Beetle, a new Pest of Cereals, Malt and Pulses.]—*Marktbericht Hansablum*, no. 214, suppmt., pp. 8–10, 12 refs. Hamburg, 8th September 1926.

This paper contains a description of the khapra beetle, *Trogoderma granarium*, Everts, and of its biology. Though trapping is useful [*R.A.E.*, A, xii, 482], it must be supplemented by insecticides. If floors, wooden walls, etc., are scrubbed with hot water containing 2 per cent. of soap, the larvae will be rapidly killed. Carbon bisulphide is the best fumigant for sacks.

Escherich (K.). **Forstentomologische Grundlagen der Flugzeugbekämpfung.** [Forest Entomology as the Basis of Insecticide Application from Aeroplanes.]—*Der Deutsche Forstwirt*, viii, no. 10, pp. 97–98. Berlin, 20th January 1926. [Recd. October 1926.]

It is considered that if aeroplanes are to be used economically for applying insectides against forest pests, it will be necessary to undertake research to ascertain the minimum doses for each species.

Bremer (H.). **Zur Epidemiologie der Rübenfliege** (*Pegomyia hyoscyami* **Pz.**). **Vorläufige Mitteilung.** [On the Epidemiology of the Beet Fly, *P. hyoscyami*. Preliminary Communication.]—*Anz. Schädlingsk.*, ii, no. 10, pp. 133–135. Berlin, 15th October 1926.

The geographical distribution of *Pegomyia hyoscyami*, Pz., the history of previous outbreaks of this pest, and the results of experiments in the physiology of its development are discussed. Cool weather in summer (within certain limits) is considered the chief factor leading to an outbreak. Though the fly has more generations a year in Central and Southern Europe, it is only a serious pest farther north.

Eidmann (H.). **Der Maiszünsler in Amerika.** [*Pyrausta nubilalis* in America.]—*Anz. Schädlingsk.*, ii, no. 10, pp. 137–139. Berlin, 15th October 1926.

This is a brief account of the occurrence of *Pyrausta nubilalis*, Hb., on maize in the United States, and of the work directed against it there.

Friederichs (K.). **Rapsglanzkäfer und Rapsrüssler.** [The Rape Beetle and the Rape Weevil.]—*Anz. Schädlingsk.*, ii, no. 10, pp. 140–141. Berlin, 15th October 1926.

This is a criticism of the view expressed by Wolff & Krausse that the rape-weevil, *Ceuthorrhynchus assimilis*, Payk., is really responsible for much of the injury ascribed to the rape-beetle, *Meligethes aeneus*, F. [*R.A.E.*, A, xiv, 432].

Handlirsch (A.). **Biologie (Oekologie—Ethologie).**—*in* Schröder: *Handb. Ent.*, ii, pp. 1–218, 151 figs., 25 pp. refs. Jena, G. Fischer, 1926.

This is a general review of the life-history of insects in relation to their environment.

Reh (L.). **Pflanzenschädliche Insekten.** [Insect Pests of Plants.]—*in* Schröder: *Handb. Ent.*, ii, pp. 308–328, many refs. Jena, G. Fischer, 1926.

In this general review of the insect pests of plants and their control a number of instances of the enormous damage caused by them are given. The vine *Phylloxera* costs Germany about £50,000 a year, and in 50 years has cost France £1,200,000,000. The Colorado beetle [*Leptinotarsa decemlineata*] diminishes the potato harvest of North America by £500,000 a year. The olive fly (*Dacus oleae*) causes an annual loss in Italy of £600,000. *Clysia ambiguella*, Hb., in 1897 caused damage in France and Germany to the extent of £5,500,000.

May beetles (*Melolontha*) cause a yearly loss in France of ten to forty million pounds. In Algeria in 1866, locusts were responsible for a famine which, with its resultant epidemic, destroyed 5 per cent. of the population. The annual loss due to farm and forest pests in the United States is reckoned to amount to £250,000,000, while that for Germany is £100,000,000.

GANDRUP (J.). **De verspreiding van** *Cryptolaemus montrouzieri* **in de residentie Besoeki.** [The Distribution of *C. montrouzieri* in the Residency of Besoeki.]—*Arch. Koffiecult. Ned.-Indië*, i, pp. 119–123, 1925. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, II. Abt., lxviii, no. 15–25, p. 458. Jena, 8th October 1926.)

The Coccinellid, *Cryptolaemus montrouzieri*, imported into Java from Hawaii by van der Goot in 1918 to combat the coffee mealybug [*Pseudococcus virgatus*] has become established throughout eastern Java, but its practical value has not been tested as climatic conditions have prevented any outbreak of the pest.

BÖNING (K.). **Die Apfelblattmotte.** [The Apple Leaf Moth.]—*Der Obst- u. Gemüsebau*, no. 6, 1926, reprint, 2 pp., 2 figs. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, II. Abt., lxviii, no. 15–25, pp. 466–467. Jena, 8th October 1926.)

The apple leaf skeletoniser, *Hemerophila* (*Simaethis*) *pariana*, did considerable harm in Germany in 1925. It attacks all varieties of apple, and is also found on pear, stone-fruits and *Crataegus*. Arsenical sprays should be used early, before the webs are spun.

GASSNER (G.). **Blausäurebehandlung als Stimulationsmittel im praktischen Pflanzenbau.** [Treatment with Hydrocyanic Acid Gas as a Plant Stimulant in practical Plant Growing.]—*Angew. Botanik*, vii, pp. 74–79, 1925. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, II. Abt., lxviii, no. 15–25, p. 467. Jena, 8th October 1926.)

As a result of fumigation work with hydrocyanic acid gas by the Zyklon method already noticed [*R.A.E.*, A, xiii, 436], it was found that the treatment stimulated the growth of the orange trees concerned and led to increased crop yields.

MOLZ (E.). **Ueber den heutigen Stand der Frage der Bekämpfung des Rübennematoden.** [On the present Position of the Question of the Control of the Beet Nematode.]—*Dtsch. Landw. Presse*, liii, pp. 195–196, 1926. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, II. Abt., lxviii, no. 15–25, pp. 480–481. Jena, 8th October 1926.)

The various measures that have been suggested against the beet Nematode [*Heterodera schachtii*, Schmidt] are reviewed [*cf. R.A.E.*, A, x, 568 ; xiii, 573, etc.]. The author states that he has succeeded in obtaining a strain of beet that yields twice as much as the standard beet in the experimental Nematode-infested field.

Zacher (F.). **Der Schädlingsbefall im Auslandsgetreide.** [The Infestation by Insect Pests of Cereals imported into Germany from Abroad.]—*Marktbericht Hansablum*, Suppmt., pp. 119–125, 8–13. Hamburg, 14th & 28th July 1926.

The information given in this paper is substantially the same as in one already noticed [*R.A.E.*, A, xii, 41].

Naumann (A.). **Schädlinge an** [Pests of] *Chrysanthemum indicum.*—*Die kranke Pflanze*, iii, no. 10, pp. 185–188. Dresden, October 1926.

In Germany the only insect that attacks *Chrysanthemum indicum* to any extent is the earwig, *Forficula auricularia*, which may be controlled by means of the usual shelter-traps. Two Lygaeid bugs, *Lygus campestris* and *L. pabulinus*, puncture the terminal shoots and leaves. *L. bipunctatus* and *Calocoris binotatus* are noted in the literature as attacking *C. indicum*. These pests are difficult to combat; the measures suggested are spraying with quassia solution in the morning when the bugs are inactive; dusting the ends of the shoots with pyrethrum powder or with a mixture of 1 part pyrethrum and 2 parts sulphur; fumigation (in the greenhouse) with tobacco dust at the rate of 30 grains to 35 cu. ft.; jarring the bugs in the morning on to boards covered with adhesive; and the removal of all weeds of the order Compositae. The Nematode, *Aphelenchus ritzema-bosi*, is the most serious pest of *C. indicum*. Infested plants may be dipped for 1 hour in water of 18°–20° C. [64·4°–68° F.] and then for 5 minutes in water of 50° C. [122° F.] or for 10 minutes in water of 43° C. [109·4° F.]. A caterpillar, presumably that of *Cnephesia wahlbomiana* subsp. *chrysantheana*, infests the terminal shoots, which should be removed and burnt. The larvae of *Barathra* (*Mamestra*) *brassicae* and *Polia* (*M.*) *oleracea* are occasional pests of chrysanthemums.

Escherich (K.). **Neuzeitliche Bekämpfung tierischer Schädlinge.** [Modern Work against Insect Pests.]—*Fortschritte Landw.*, i, no. 20, pp. 647–648. Vienna, 15th October 1926.

This is a brief survey of modern methods used in Germany against insects injurious to agriculture and forestry.

Kéler (S.). **Kilka słów o kwieciaku jabłkowym** (*Anthonomus pomorum*) **i o popularyzacji walki z nim.** [Notes on *A. pomorum* and the Popularisation of its Control.]—*Choroby i szkodniki Roślin*, ii, no. 1, pp. 22–23, 4 figs. Warsaw, 1926.

This paper includes illustrations of different stages of the larvae of the Ichneumonid, *Pimpla nucum*, Ratz., parasitic on those of *Anthonomus pomorum*, L.

Minkiewicz (S.). **Wykaz wazniejszych szkodników, występujących w Polsce na roślinach uprawnych.** [List of the most important injurious Animals attacking cultivated Plants in Poland.]—*Choroby i szkodniki Roślin*, ii, no. 1, pp. 24–32. Warsaw, 1926. (With a Summary in English.)

This is an annotated list of pests, including noxious insects, classified according to the kind of crop attacked. A brief summary is also given of recent remedial measures employed against *Lymantria monacha*, L. [*R.A.E.*, A, xiv, 197].

STRAWIŃSKI (K.). **Świece dymowo-arszenikowe jako środek zwalczania szkodliwych owadów.** [Arsenical Fumigating Candles as a Means of controlling Insect Pests.]—*Choroby i szkodniki Roślin*, ii, no. 1, pp. 33–40, 2 figs., 3 refs. Warsaw, 1926. (With a Summary in French.)

Fumigating candles [*R.A.E.*, A, xiv, 197] have been used successfully for the control of *Cheimatobia brumata*, L., attacking fruit trees in Poland. The candles give off a dense cloud of smoke, which surrounds the tree and settles on the foliage in the form of arsenious oxide (AS_2O_3). The young larvae succumb in a few hours (11–16) after contact with the smoke, while Aphids and Psyllids are killed even more quickly. The larvae that are not reached by the smoke die after feeding on even a very small portion of the leaves.

CHRZANOWSKI (A.). *Chlorops taeniopus* **Meig., a czas siewu pszenicy i odporność odmian ozimych i jarych.** [*C. taeniopus*, the Time of sowing Wheat and the Resistance of Winter and Spring Sowings.]—*Choroby i szkodniki Roślin*, ii, no. 1, pp. 44–50, 1 graph. Warsaw, 1926. (With a Summary in French.)

The resistance of different varieties of wheat and the relation of the time of sowing to damage caused by *Chlorops taeniopus*, Meig., is discussed. Autumn sowing should be done as early as possible, as the injury appears to stand in direct relation to the time of ripening.

LEBEDEV (A.). *Pityogenes spessivtsevi* **n. sp. (Col. Ipidae).**—*Ent. Bl.*, xxii, no. 3, pp. 120–123, 2 figs. Berlin, 30th September 1926.

Ips (*Pityogenes*) *spessivtsevi* is described from *Picea* sp. probably *P. schrenkiana* in Russian Turkestan.

[RUSANOVA (V. N.).] **Русанова (В. Н.).** *Urellia eluta*, **Mgn., as a Pest of** *Carthamus tinctorius*. **(Preliminary Report.)** [*In Russian.*]—Zhurn. Opuitn. Agron. Yugo-Vostoka [*Jl. Exptl. Agron. South-East*], iii, pt. 1, reprint, 19 pp., 4 refs. [Saratov] 1926.

The Trypetid, *Urellia eluta*, Mg., of which the various stages are described, is the most important pest of the safflower (*Carthamus tinctorius*) in south-eastern Russia. Observations on its life-history have been made so far as possible in the field and supplemented by laboratory experiments. Under artificial conditions it could not be bred satisfactorily until placed on a medium of crushed raisins and gelatine to which yeast had been added. This method has been successfully used by American workers for rearing *Drosophila melanogaster*, Mg. Even under these conditions a full generation could not be reared, as the material decomposed before the adults emerged, the decomposition affecting the pupae. Life-history records were eventually obtained by rearing the fly from the egg to the pupa on this medium and by placing freshly collected pupae on a fresh supply of the same medium.

The results were compared with field observations ; they indicate an egg stage of 2–3 days, a larval stage of 15–21 days, and a pupal stage of 10–12 days, giving an entire life-cycle of 27–36 days.

The adults are first seen in the field in June, when the safflower is beginning to bloom. Each female lays about 20 eggs, which are inserted between the tender leaves enveloping the flower-head ; they are usually laid in batches. The larva bores through the leaf tissue into the flower-head just as the seeds are beginning to form, their covering being soft and succulent. The entire seed substance is attacked, and as a result becomes semi-liquid, apparently owing to bacterial infection. Pupation occurs between the healthy and attacked seeds. The adults emerging from these pupae apparently pass the winter and oviposit in the spring on *Carduus* spp. and other Compositae found in the vicinity of safflower. It is the progeny of this generation that later attacks safflower, there thus being two generations a year.

A study of the injury done to the safflower crop by *U. eluta* in relation to time of sowing and variety chosen indicates that protection from loss of seed depends on the formation of a resistant layer [*R.A.E.*, A, xiv, 28] before the larvae can penetrate to the seed. This may be regulated by the time of sowing or the choice of varieties with quick-forming, strong resistant layers. The smaller and weakly heads are more subject to attack, as are also the non-echinate varieties.

[Pospelov (V. P.).] **Поспелов (В. П.). Annual Report of the Department of Applied Entomology, October 1923-October 1924.** [*In Russian.*]—*Ann. State Inst. Exptl. Agron.*, ii, no. 6, pp. 243–252. Leningrad, 1924. [Recd. October 1926.]

A general review is given of the year's work of the department, some of which has already been noticed from more detailed accounts [*R.A.E.*, A, xii, 459 ; xiii, 306, 543 ; xiv, 226]. The Braconid, *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., is being successfully bred in captivity on *Ephestia kühniella*, L., for liberation against the corn borer [*Pyrausta nubilalis*, Hb.]. During the summer of 1923 a search for parasites of *Euxoa segetum*, Schiff., was made in the Vologda and Cherepovetz governments. *Banchus falcatorius*, F., proved the most prolific, as many as 1,000 eggs being laid by one individual. *Amicroplus* (*Macrocentrus*) *collaris*, Spin., is also being bred artificially.

With regard to forest pests, felled trees proved the best form of trap for *Pissodes pini*, L., while *Hylobius abietis*, L., and *Hylastes ater*, Payk., were successfully trapped in pieces of freshly removed bark.

After injury to the buds by the apple weevil [*Anthonomus pomorum*, L.] some varieties of trees produce seedless fruit. The economic importance of this pest varies according to the type of tree attacked ; some produce such a large number of blossoms that only 5–10 per cent. develop into fruit ; the rest fall and include those attacked by the weevil.

Though a temperature of 35° C. [95° F.] is considered to be critical for *Oscinella* (*Oscinosoma*) *frit*, L., under which conditions it cannot live more than 3–5 days without affecting its reproductive powers, it survived 47 days at that temperature with a humidity of 40 per cent in the present experiments.

[SHCHELKANOVTZEV (Ya. P.).] **Щелкановцев (Я. П.). Relations between Climatic Conditions and Abundance of** *Euxoa segetum,* **Schiff., during the past 50 Years in the Government of Voronezh.** [*In Russian.*]—Zapiski Voronezhsk. S.-Kh. Inst. [*Notes of the Voronezh Agric. Inst.*], v, reprint, 8 pp. Voronezh, 1926. (With a Summary in German.)

The monthly rainfall occurring at Voronezh since 1878 is shown in tables and is compared with the annual abundance of *Euxoa segetum,* Schiff. The results indicate that a precipitation above the average (2 in.) during one or all of the months May to July is particularly favourable to this pest.

[SHCHELKANOVTZEV (Ya. P.).] **Щелкановцев (Я. П.). Summer and Winter Observations on Insects in the Forests of the Voronezh Agricultural Institute.** [*In Russian.*]—Zapiski Voronezhsk. S.-Kh. Inst. [*Notes of the Voronezh Agric. Inst.*], vi, reprint 8 pp., 8 refs. Voronezh, 1926.

The varying references in the literature as to the situation chosen by the gipsy moth [*Porthetria dispar,* L.] for oviposition are reviewed and compared with personal observations. It is considered that general temperature conditions are the governing factors, as in southern areas the eggs are laid higher on the trees where the air is cooled by the wind, and in other places they were found on the northern sides of the trees when the summer was hot and dry and on any side of the tree when it was wet and cool.

Aradus cinnamomeus, Pnz., is recorded for the first time from Voronezh and Chernigov, where it was causing considerable injury to young pine trees. In Chernigov it was particularly injurious to trees of 15–18 years of age growing on poor sandy soil. No injury to the needles was observed, though on attacked trees they turn yellow. Hibernation apparently occurs in the adult stage, and there is presumably only one generation a year [*cf. R.A.E.,* A, xiii, 375].

[MOGILYANSKIĬ (N. K.).] **Могилянский (Н. К.).** *Phylloxera,* **its Distribution and Control.** [*In Russian.*]—Vestnik Plodovodstva, Vinogradarstva i Ogorodnichestva [*Herald of Hortic. & Vitic.*], 1925, nos. 8–11, pp. 391–410 & 466–488, 13 figs. [Kharkov] August-November 1925. [Recd. November 1926.]

The first part of this paper has already been noticed [*R.A.E.,* A, xiv, 318]; the second, which is also compiled from the work of other authors, deals mainly with cultural methods of control.

[FILIP'EV (I. N.).] **Филипьев (И. Н.). Injurious Insects and other Animals in U.S.S.R. in the Years 1921-1924. Part I. General Introduction.** [*In Russian.*]—*State Inst. Exptl. Agron., Works on App. Ent.,* xiii, pp. 1–55, 856 refs., 2 maps. Leningrad, 1926.

This work is intended as a record of the occurrence of pests of general importance throughout European and Asiatic Russia, and it is hoped to show so far as possible their geographical distribution, abundance and economic importance. To be of value as a basis for future observations the Palaearctic Region has been divided into areas and sub-areas by the decimal scheme, which is here explained and illustrated by maps. This part also includes an extensive bibliography, containing references to all available literature on the subject either of a scientific or popular nature dealing with 1921–24. Publications appearing in 1926 and those of 1925 dealing exclusively with that year have not been included.

[Filip'ev (I. N.).] **Филипьев (И. Н.). Injurious Insects and other Animals in U.S.S.R. in the Years 1921-1924. Part II. Acridiodea.** [*In Russian.*]—*State Inst. Exptl. Agron., Works on App. Ent.*, xiii, pp. 57–176, 10 maps, numerous tables. Leningrad, 1926. (With a Summary in English pp. 169–176.)

The period under review has been characterised by serious outbreaks of locusts and grasshoppers. An extensive survey is given of the distribution of every species in each province, and the breeding areas are carefully defined, while a great amount of statistical data is accumulated as to the areas occupied by locusts and the control work done. A great advance has been made in the technique of control, particularly in the application of poison baits.

The drought of 1921 was responsible for an enormous development of *Gomphocerus sibiricus*, L., all over Siberia and of *Calliptamus italicus*, L., in the Volga region and the Kirghiz steppes. In the same year *Locusta migratoria*, L., began to multiply in the Kuban province. In 1922 the two first-named species were still very injurious in the same regions, while *Locusta migratoria* attained its maximum in the North Caucasus, and *Dociostaurus maroccanus*, Thnbg., devastated East Transcaucasia. In 1923 it was *C. italicus* that occupied the first place, spreading over enormous tracts of the country; *D. maroccanus* also reached its maximum, while *L. migratoria* appeared in places in Central Russia, where it does not usually occur. On the whole, that year was one of maximum development of all locusts, but the cool autumn had an unfavourable effect on most species. In 1924 *G. sibiricus* practically disappeared from the central parts of Siberia, but was still very important in the Ural region and in the Far East; *C. italicus* was less plentiful, but spread over Ukraine; *L. migratoria* disappeared in Central Russia, but attained a maximum in Turkestan, while *D. maroccanus* was scarce everywhere.

Other species of economic importance were: *Stauroderus scalaris*, F.W., *Chorthippus albomarginatus*, DeG., *Dociostaurus crucigerus brevicollis*, Ev., *D. kraussi*, Ingen., *Arcyptera microptera*, F.W., *A. fusca*, Pall., *Oedaleus decorus*, Germ., *Podisma pedestris*, L., *Prumna primnoa*, F.W., and *Thisoecetrinus pterostichus*, F.W., the last-named injuring melon fields in East Transcaucasia.

[Kolobova (A. N.).] **Колобова (А. Н.).** *Stenothrips graminum*, **Uzel.** [*In Russian.*]—Trudui Poltavsk. S.-Kh. Opuitn. Stantz. [*Trans. Poltava Agric. Expt. Sta.*], no. 49, Ent. Div. no. xii, 26 pp., 6 figs., 7 refs. Poltava, 1926.

The various stages and life-history of *Stenothrips graminum*, Uzel, as observed near Poltava in 1921–23, are described. Its distribution in Russia reaches from the 43rd parallel to the 56th, but it is more abundant in the southern areas. No examples have been received from Asiatic Russia. Life-history studies were made under artificial conditions and confirmed so far as possible by observations in the open. Details are given of a box for making counts of the daily appearance of thrips in the field ; it is placed on the ground where the thrips are expected to emerge and has a single opening through which the light enters, and to which the thrips are attracted. This opening is covered with a glass jar in which they are trapped.

When the adults first appear, about the beginning of June, they mostly settle on barley, as the ears are already formed in this crop, which is not the case with oats. They rapidly migrate to oats, however, as soon as the panicle is formed. *S. graminum* has only been found on graminaceous plants, and of these it only breeds on oats and *Avena fatua*. The eggs are laid between the centre and base of the scale, each female laying about 100, at the rate of 3–4 daily. They hatch in seven days under laboratory conditions. The scales turn yellow in the upper part, which is attacked by the adults, the discolouration spreading over the entire scale after larvae have fed on it. The larvae live in the panicle for 7–10 days, after which they enter the soil for transformation in June or early July. The pre-nymphal stage lasts 2–2½ days, and the nymphal stage four days ; these stages were found at varying depths from 6 to 20 inches under experimental conditions. Contrary to a previous record [*R.A.E.*, A, ii, 170], the winter is passed in the soil in the adult stage, at depths of 12–31 inches. A number of the adults are infested with an unidentified Nematode, infestation being acquired in the soil. Though the infested individuals live a long time, they are unable to reproduce. The predacious thrips, *Aeolothrips fasciatus*, F., destroys a considerable number of the larvae and adults of *S. graminum*.

The relation of the injury done by this thrips to different varieties of oats and to the time of sowing and development of the ears has received considerable attention, the results showing that as the maximum egg-laying period falls between 15th and 22nd June, the varieties to suffer least will be those that are able to form ears before 15th June. In a normal spring, if early varieties are sown before 15th April, they will form ears before the eggs are laid, while late varieties may escape a great proportion of injury if sown early in April. Under late spring conditions, however, the early varieties will be heavily infested, while the late varieties will not begin forming ears until after the main flight of the thrips and will be only slightly attacked ; their use is, however, not recommended, as in this case they are more subject to attack by the frit fly [*Oscinella frit*, L.].

Neither contact insecticides nor cultural measures are of any practical value against this thrips.

[PISNYACHEVSKIĬ (A. A.).] **Писнячевский (A. A.). Notes on the Ecology of** *Anthonomus pomorum*, **L. (Preliminary Paper.)** [*In Russian.*] —*Défense des Plantes*, iii, no. 2–3, pp. 124–142. Leningrad, July 1926.

Observations on the relative number of individuals of *Anthonomus pomorum*, L., caught by banding the trees and by jarring are described in detail. Shelter bands are not considered of much use unless they are examined very frequently [*R.A.E.*, A, x, 608] ; jarring is of greater value. Where jarring is adopted, it is important that a sheet large enough to catch all the falling weevils should be placed underneath the trees. Many of the weevils may be trapped by placing heaps of leaves, etc., near the bases of the trees and destroying these with the hibernating weevils just before the permanent layer of snow falls.

[Nevskiĭ (V. P.).] (**Невский (В. П.).** **Some Observations on the Biology of** *Pterochlorus* (*Pterochloroides*) *persicae*, **Cholod.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 143–157, 9 figs., 1 ref. Leningrad, July 1926.

These observations, made with a view to supplementing the work of Arkhangel'skii [*R.A.E.*, A, v, 563], are described at great length. The overwintering eggs of *Pterochlorus persicae*, Cholod., are laid by unfertilised females, no males of this Aphid being known. The oviparous females appear in October, succeeding the viviparous generations; the latter are incapable of oviposition. Varied experiments proving this fact are discussed. The discovery of embryos and eggs in the same individual, recorded by Arkhangel'skii, is possibly erroneous, as the undeveloped embryos are very difficult to distinguish from the eggs. The anatomical differences between the viviparous and oviparous females are described.

Attempts to transfer *P. persicae* to other food-plants were not very successful, and in nature peaches are obviously preferred; apricots even in close proximity to them are rarely attacked. The natural enemies of this Aphid include various predacious insects and a Braconid parasite, *Aphidius* sp. A detailed account is given of the bionomics of the latter and of a Chalcidoid hyperparasite of it.

[Rodionov (Z. S.).] **Родионов (З. С.).** **Crickets as Pests of Cotton.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 158–164, 4 figs. Leningrad, July 1926.

During 1925 crickets were responsible for the failure of a proportion of the cotton seed sown by 31st May in Mugan, Transcaucasia. The young seedlings were attacked near the root and so weakened that they could not penetrate the top layer of soil, about 15 per cent. having died from the injury. An egg found inserted in one of the plants resembled those of *Gryllus burdigalensis*, Latr. *G. burdigalensis* var. *cerisyi*, Serv., and *G. desertus*, Pall., were both found in the field; the eggs of the latter are laid in cracks in the ground. Both species are concerned in the injury to cotton seedlings; they prefer humid places and occur in abundance on the wing at night from the end of May to end of July. Besides cotton, they do considerable damage to *Sesamum orientale* and also feed on *Convolvulus*. Fields in which cotton oil-cake was used as a fertiliser recovered best from the injury, this material being probably more attractive than the plants themselves.

[Stark (V. N.).] **Старк (В. Н.).** **The Relation between the Development of** *Crypturgus cinereus*, **Herbst, and** *Myelophilus* (*Blastophagus*) *minor*, **Hart., under Briansk Forest Conditions.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 164–167. Leningrad, July 1926.

Crypturgus cinereus, Hbst., is not a primary pest of forest trees [*R.A.E.*, A, xiii, 472]; it hardly ever penetrates the bark of the trees but normally utilises the galleries made by various other bark-beetles, chiefly *Myelophilus minor*, Hart. The entry of *C. cinereus* into the galleries of *M. minor* usually coincides with the oviposition of the latter, and any eggs met on the way by the invading beetle are destroyed mechanically. Under conditions of normal infestation by *M. minor*, a large number are destroyed by *C. cinereus*, but in the presence of factors producing an abnormal increase of *M. minor* [*loc. cit.*] the check exercised on it by *C. cinereus* is negligible.

[STARK (N. K.).] **Старк (Н. К.). On the Distribution of the Sexes of some Longicorn Larvae in Trees.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 167–170, 2 figs. Leningrad, July 1926.

Observations on *Callidium sanguineum*, L., and *Saperda scalaris*, L., infesting old oak trees have shown that the larvae and pupae found at different depths in the tree are not of the same sex. The females invariably occur in the deeper galleries and feed longer than the males, which are usually found under the bark. The same distribution of sexes may apply to other species such as *Acanthocinus aedilis*, L., and *Pissodes pini*, L., in which the occurrence of pupae in different parts of the tree has been attributed to the thickness of the bark.

RODIONOV (Z. S.). **Родионов (З. С.). Pests of Cotton in the Azerbaijan and Nakhichevan Republics in 1925.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 170–171, 1 ref. Leningrad, July 1926.

A species of *Tetranychus* is one of the most serious pests of cotton in Transcaucasia. Dusting operations with sulphur during 1925 against this mite resulted in an average increase in production of 70 per cent. [but *cf. R.A.E.*, A, xiv, 508]. Most of the other pests mentioned have already been recorded [*loc. cit.*].

Heliothis obsoleta, F. (*armigera*, Hb.) is one of the most injurious pests of cotton in Azerbaijan, having usually three generations a year [but *cf. R.A.E.*, A, xii, 262]. Trap-crops of maize have proved effective; another recommendation is autumn or early spring ploughing, followed by liberal watering, the adults being unable to emerge through the wet soil.

[SAKHAROV (N. L.).] **Сахаров (Н. Л.). Injurious Insects in the Lower Volga Region.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 171–185, 1 map, 14 refs. Leningrad, July 1926.

This is a general account of the soil conditions of the Lower Volga region and their relation to the occurrence of injurious insects, a number of pests being cited in illustration. The various pests occurring in the region are recorded [*cf. R.A.E.*, xiv, 28, etc.].

[MEĬER (N. F.).] **Мейер (Н. Ф.). Keys for the Determination of the Genera of the Family Ichneumonidae. (Part II. Subfamilies Ophioninae and Tryphoninae.)** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 199–217, 14 figs. Leningrad, July 1926.

This is part ii of the keys previously noticed [*R.A.E.*, A, xiv, 420].

[Nevskiĭ (V. P.).] Невский (В. П.). **Central-Asiatic Experimental Station for the Protection of Plants.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 248–251. Leningrad, July 1926.

The work at this station mainly consists of biological observations on injurious insects, those studied during 1925 being chiefly cotton and orchard pests. The latter included *Cosmia subtilis*, Stgr., attacking apricots; this moth may be controlled by a dust of flowers of sulphur and Paris green; spraying was not practicable. The best measure against *Stephanitis pyri*, Geoff., is spraying or dusting with nicotine.

[Parfent'ev (I. A.) & Krestovnikov (A. N.).] Парфентьев (И. А.) и Крестовников (А. Н.). **Testing Insecticides containing Arsenic.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 251–257, 1 ref. Leningrad, July 1926.

The various tests for the presence of different forms of arsenic in insecticides are discussed.

[Goryainov (A. A.).] Горяинов (А. А.). **Chloropicrin in the Contro of Grain and Plant Pests.** [*In Russian.*]—*Défense des Plantes* iii, no. 2–3, pp. 258–271. Leningrad, July 1926.

This extensive account of the use of chloropicrin for the control o noxious insects and other pests is based mainly on the work of Frenc authors. It is considered to be the best method of controlling pests o stored products, but must not be used where fermentation is in progres as this is inhibited by the action of the gas.

In preliminary experiments it was also found to destroy whea Nematodes in galls, at strengths of either 20 cc. or 40 cc. to the cubi metre.

[Gal'kov (V. P.).] Гальков (В. П.). **Sodium Bichromate as Fungicide and Insecticide.** [*In Russian.*]—*Défense des Plante* iii, no. 2–3, pp. 271–272. Leningrad, July 1926.

Sodium bichromate has been tried as a substitute for arsenic in th control of pests. The experiments were of a preliminary nature an made under very unfavourable conditions, but their results warran further trials on a larger scale. Used in bran baits, 1 part to 100–15 of water, it caused death in 30–70 per cent. of locusts in fiel experiments.

[Nevskiĭ (V.).] Невский (В.). **A Change in the Method Controlling the Asiatic Locust.** [*In Russian.*]—*Défense de Plantes*, iii, no. 2–3, pp. 276–277. Leningrad, July 1926.

This method of controlling the Asiatic locust [*Locusta migratoria*, L is based on its instinct to follow the line of least resistance. A dee pit (not more than 70 ft. long) with perpendicular walls is dug at som distance in front of the advancing locusts; a road is then made b continual trampling of men and horses, leading directly from th locusts to the pit. Similar paths are also made diagonally, each leadi into the main road. The locusts are thus led on to the main road an into the pit, where they are buried as the pit gets full. This metho is much cheaper than the old one, in which a much longer trench was dug to receive the advancing swarm, and is even cheaper than the poison bait method.

[TARBINSKIĬ (S.).] **Тарбинский (С.). On the Distribution of Orthoptera in U.S.S.R.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 278–280. Leningrad, July 1926.

This paper is the first of a series in which the distribution of Orthoptera throughout Russia is to be dealt with, notes on 49 species being given.

[VORONTZOVSKIĬ (P.).] **Воронцовский (П.). New Cases of Parasitism in Acridodea.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, p. 280. Leningrad, July 1926.

The Bombyliid, *Systoechus autumnalis*, Pall., has been reared from egg-masses of *Dociostaurus albicornis*, Ev., *D. kraussi*, Ingen., and *Arcyptera flavicosta*, F. W., and the Meloid, *Mylabris quatuordecimpunctata*, Pall., from those of *D. kraussi*, in Orenburg.

[BOGDANOV-KAT'KOV (N. N.).] **Богданов-Катьков (Н.Н.). A List of Publications on Applied Entomology in 1924 and 1925.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 293–316. Leningrad, July 1926.

This is a list of Russian papers on applied entomology for the years 1924 and 1925.

LUNDBLAD (O.). **Några försök med fångstgördlar mot äpplevecklaren** (*Carpocapsa* [*Laspeyresia, Cydia*] *pomonella*, **L.**). [Investigations on Banding against *Cydia pomonella.*]—*Medd. Centralanst. försöks. jordbruks.*, no. 298 (Ent. avdel. no. 48), 41 pp., 9 figs., 33 refs. Stockholm, 1926. (With a Summary in German.)

Experiments made in Sweden in banding apple trees against *Cydia pomonella* are described. In each of 15 localities 25–30 trees were fitted with bands of corrugated paper. In all 19,527 Arthropods were collected, of which only 410 were *C. pomonella*. There were 27 small Carabids, 69 Clerids, 109 Coccinellids, 114 *Anthonomus pomorum*, 3,771 Hemerobiids (mainly *Boriomyia nervosa*), 457 *Anthocoris gallarum-ulmi*, 340 *A. nemorum*, 3,763 second-stage nymphs of *Pentatoma rufipes*, 1,858 *Aegilips* sp., 248 *Anacharis* sp., and 2,585 spiders. All are beneficial species except *A. pomorum* ; *Aegilips* and *Anacharis*, which are parasites of *Boriomyia nervosa* ; and perhaps *P. rufipes*, the status of which is doubtful. When the bands are taken off they should be shaken in order to remove as many useful insects and spiders as possible. The larvae of *C. pomonella* remain in the bands, being firmly attached by their webs. As, however, the bands will still contain many useful species, they should be kept in boxes left open until all the individuals of *B. nervosa* have emerged, when they should be closed to prevent the escape of *C. pomonella* and of the parasites of *Boriomyia*, which emerge later. It is probable that both banding and arsenical sprays are needed to combat *C. pomonella* effectively.

KEMNER (N. A.). **Clercks minerarmal** (*Lyonetia clerckella* **L.), dess biologie och metoderna för dess bekämpande.** [*L. clerckella*, its Biology and Control.]—*Medd. Centralanst. försöks. jordbruks.*, no. 301 (Ent. avdel. no. 49), 59 pp., 14 figs., 41 refs. Stockholm, 1926. (With a Summary in English.)

In Sweden *Lyonetia clerckella*, L., is generally unimportant, but occasionally it increases to such an extent as to defoliate fruit trees. It may be an important pest up to 60° N. latitude. A serious outbreak occurred in southern Sweden in 1921–1923, from 20 to 44 cocoons being observed on each leaf in the case of several trees. A detailed description is given of this moth. The eggs are laid in small holes made with the ovipositor on the underside of the leaf. The larvae mine the leaves, the exit of the mine being on the upper leaf-surface. They usually pupate on another leaf, but sometimes, especially in autumn, on the trunk and twigs. The times of development in summer are 14–16 days for the egg, 20–25 for the larva, and 13–14 for the pupa. In autumn a little longer is required. Two or three generations a year occur, the first larval attack taking place at the end of June, the second in August and the third more irregularly later in the autumn. The moth hibernates under pieces of bark, moss, and lichens on the fruit trees; it is not found amongst the fallen leaves, where, however, occur the pupae of its parasites, *Eulophus longulus*, Zett., *E. stramineipes*, Thoms., *Cirrospilus vittatus*, Wlk., *C. pictus*, Nees, *Closterocerus trifasciatus*, Westw., *Sympiesis sericeicornis*, Nees, *Chrysocharis boops*, Thoms., and *Hemiteles bicolorinus*, Grav. *E. longulus* is of great importance, as it is abundant earlier than the others. Experiments showed that fallen autumn leaves in gardens that have been attacked by *L. clerckella* may after the winter be regarded as yielding only the parasites of the moth. One control measure would therefore be the collection of such leaves and their conveyance to other places where the pest is increasing. Spraying with 8–10 per cent. carbolineum in early spring to destroy the moths hibernating on the trunks is useful, and more so if the trunks are first scraped, the débris being destroyed. Nicotine sprays are of value during the vegetative period. A solution of 1 per mille nicotine kills the larvae in their mines and the pupae in their webs, and does not seem to harm the parasites.

VOGT (E.). **Die chemischen Pflanzenschutzmittel, ihre Anwendung und Wirkung.** [Chemical Insecticides and Fungicides; their Use and Effect.]—Small 8vo, 134 pp., 12 figs. Berlin, Walter de Gruyter & Co., 1926. Linen, Price *Mk.* 1,50.

In view of the large number of insecticides and fungicides, of very varying value, that are on the market in Germany, this booklet has been written in order to give a review of those materials that are of proved efficiency. In the case of proprietary preparations the composition is indicated so far as possible. Machinery for using the insecticides, etc., is also discussed. Seed disinfection, liquid and dust insecticides and fungicides, and soil disinfection form the chief sections of the volume. Fumigants, chemicals for combating rodents and such special preparations as poison-baits and banding adhesives are also dealt with.

ZACHER (F.). **Das Kälteverfahren zur Pelzkonservierung.** [Cold Storage for the Preservation of Furs.]—*Mitt. Ges. Vorratsschutz,* ii, no. 4, pp. 48–50, no. 6, pp. 72–75, 1 fig. Berlin, September & November 1926.

Heat is injurious to furs, but cold storage is beneficial to them and destroys pests infesting them. It is not, however, capable of killing all individuals of all stages under conditions obtaining in practice, and must, therefore, be supplemented by such measures as beating or vacuum fumigation.

FLURY (F.). **Gesundheitliche Gefahren beim Arbeiten mit giftigen Gasen.** [Sanitary Dangers in Work with poisonous Gases.]—*Mitt. Ges. Vorratsschutz,* ii, no. 5, pp. 41–44, no. 6, pp. 69–71. Berlin, September & November 1926.

This is a short account of the dangers involved in using the poisonous gases employed against insect pests and of methods for the protection of operators.

JANISCH (E.). **Die Entwesung von Waren im Kleinbetrieb.** [The Destruction of Insects in Goods on a small Scale.]—*Mitt. Ges. Vorratsschutz,* ii, no. 6, pp. 71–72, 1 fig. Berlin, November 1926.

A Berlin firm has placed on the market a galvanised iron box of about 12 cu. ft. capacity in which rice and similar foodstuffs can be treated against insect pests by fumigation with carbon bisulphide, etc. The lid fits in a groove filled with water so as to form a water-seal. At one corner of the box this groove expands into a pocket fitted with a tap, so that the water can be run off conveniently. Inside the box there is a small container for the fumigant.

ZWÖLFER (W.). **Der Maiszünsler** (*Pyrausta nubilalis* **Hb.**). [The Maize Pyralid, *P. nubilalis.*]—*Badische Bl. angew. Ent.,* ii, no. 2, pp. 97–101. Freiburg i. Br., October 1926.

In view of the increase in maize cultivation in southern Germany, attention is drawn to the importance of *Pyrausta nubilalis,* Hb., and a brief general account of its biology is given.

Forstschädlingsbekämpfung durch Flugzeuge. [Control of Forest Pests by means of Aeroplanes.]—*Badische Bl. angew. Ent.,* ii, no. 2, pp. 101–105, 1 fig. Freiburg i. Br., October 1926.

This article by a member of the company that supplied the aeroplane used in the dusting experiments at Biesenthal [*R.A.E.,* A, xiv, 338], gives technical particulars concerning the machine and its equipment.

GEINITZ (B.). **Zur Geschichte der Schädlingsbekämpfung vom Flugzeug aus.** [A Contribution to the History of Insect Control by means of Aeroplanes.]—*Badische Bl. angew. Ent.,* ii, no. 2, pp. 105–107. Freiburg i. Br., October 1926.

This is a short account of the development in America and Germany of the method of using aeroplanes for applying insecticide dusts.

Geinitz (B.). **Flugzeugschädlingsbekämpfung und Imkerei.** [Insect Pest Control by Aeroplanes and Bee-keeping.]—*Badische Bl. angew. Ent.*, ii, no. 2, pp. 107–109. Freiburg i. Br., October 1926.

This article describes the losses experienced by German bee-keepers as a result of applying insecticides from aeroplanes [*R.A.E.*, A, xiv, 338], and mentions the precautions that are necessary.

Rudy (H.). **Forstentomologisches.** [A Note on Forest Entomology.] —*Badische Bl. angew. Ent.*, ii, no. 2, pp. 111–112. Freiburg i. Br., October 1926.

The leaves of *Thuja orientalis* are used by a tribe of North-American Indians to protect garments from clothes-moths, and it is possible that extracts of its leaves might have some value in this connection. It is also pointed out that the tree, *Cupressus* (*Chamaecyparis*) *lawsoniana*, is never attacked by insects, even by Melolonthid larvae, and might be valuable for planting in mixed stands in forests.

Friederichs (K.). **Die Bedeutung der Biozönose für den Pflanzenschutz.** [The Importance of the Balance of Life for Plant Protection.]—*Fortschritte Landw.*, i, no. 21, p. 685. Vienna, 1st November 1926.

This is an address read at the meeting of the German Society for Applied Entomology, held from 28th September to 2nd October 1926 in Vienna, and calls attention to the importance of a proper balance of life in plant protection.

Oudemans (A. C.). **Kritisch historisch overzicht der Acarologie. Eerste gedeelte 850 v. Chr. tot 1758.** [A critical, historical Survey of Acarology. Part One—850 b.c. to 1758 a.d.]—*Tijdschr. Ent.*, lxix, suppmt., 500 pp., 70 figs., 48 pp. refs. The Hague, October 1926.

The title of this work indicates its character.

Russo (G.). **Contributo alla conoscenza degli Scolytidi. Studio morfo-biologico del** *Chaetoptelius vestitus* **(Muls. e Rey) Fuchs e dei suoi simbionti.** [A Contribution to the Knowledge of the Scolytids. A morphological and biological Study of *C. vestitus* and its Symbionts.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xix, pp. 103–260, 48 figs., 1 pl., 52 refs. Portici, 12th September 1926.

This study of the Scolytid, *Chaetoptelius vestitus*, Muls. & Rey, contains historical and systematic notes, descriptions of the morphology of all stages and an account of the bionomics and control, the insect enemies being treated at some length. *C. vestitus* is a pest of pistachio (*Pistacia vera*) in Sicily, where it causes considerable loss annually. Other food-plants are *P. terebinthus* and *P. lentiscus*. The young adults emerge in April and May and at once begin to feed, boring through the buds into the twigs. They usually leave the feeding mine at the end of autumn or beginning of winter and make brood mines in withered twigs on the plant or lying on the ground. Some adults remain in the feeding mines during winter. As a rule those that have made a brood-mine do not die ; some survive for over a year. The larvae hatch at any season of the year. They pupate in spring, and the adult emerges shortly afterwards. The adults that have hibernated in the feeding mines attack the new buds in May. Those that have hibernated in the brood mines abandon them in March, and make new feeding mines.

The larvae and pupae have a number of natural enemies, including the mite, *Pediculoides ventricosus*, Newp. ; predacious beetles, *Laemophloeus perrisi*, Grouv., and *Cryptophagus scanicus* var. *patruelis*, Sturm ; the Chalcids, *Cheiropachys colon*, L., *Cerocephala cornigera*, Westw., *Eurytoma masii*, Russo, *Raphitelus maculatus*, Wlk., *Eupelmus urozonus*, Dalm., and *Tetrastichus* sp. ; the Braconids, *Ecphylus chaetoptelii*, Gaut. & Russo, *Dendrosoter* sp., and *Exthecus* sp. ; and the Proctotrupids, *Scleroderma* sp., and *Epyris* sp.

While the beetle is in the feeding mine, it may be combated by fumigating the plants with hydrocyanic acid gas after harvesting, but the most important measure consists in keeping the plants in a healthy condition, so as to avoid affording situations favourable for oviposition. From March to October the ground should be kept cleared of twigs, while from November to February twigs should be left lying in order to attract the beetles and then destroyed. These measures must be extended to *P. terebinthus* and *P. lentiscus*.

Benlloch (M.) & del Cañizo (J.). **La lucha contra las plagas del naranjo en España.** [Measures against Orange Pests and Diseases in Spain.]—*Bol. Estación Pat. veg.*, i, no. 3, pp. 94–98. Madrid, September 1926.

The chief insect pests of the orange in Spain are the Coccids, *Chrysomphalus dictyospermi*, Morg., *C.* (*Aonidiella*) *aurantii*, Mask., *Lepidosaphes pinnaeformis*, Bch., *L. gloveri*, Pack., *Aspidiotus hederae*, Vall., *Parlatoria zizyphus*, Luc., *Saissetia oleae*, Bern., *Coccus hesperidum*, L., *Icerya purchasi*, Mask., *Pseudococcus citri*, Risso, and *Ceroplastes sinensis*, Del Guerc. ; Aphids, particularly *Toxoptera aurantii*, Boyer ; the fruit-fly, *Ceratitis capitata*, Wied ; and ants, including the Argentine ant, *Iridomyrmex humilis*, Mayr. The measures noticed are biological control by means of the Coccinellids, *Novius cardinalis*, Muls. (against *I. purchasi*) and *Cryptolaemus montrouzieri*, Muls. (against *P. citri*), and fumigation with hydrocyanic acid gas.

Benlloch (M.). **La lucha contra la "potra" de las coles** (*Ceuthorrhynchus pleurostigma* **Marsh.**). [Measures against *C. pleurostigma* attacking Cabbages.]—*Bol. Estación Pat. veg.*, i, no. 3, pp. 105–106, 2 figs. Madrid, September 1926.

The weevil, *Ceuthorrhynchus pleurostigma*, Marsh., is a common pest of cabbage-seedlings in Galicia, where cabbages are an important crop. It also infests many other crucifers. Infested plants should be manured with sodium nitrate to promote vigorous growth. The most effective measures is the collection of infested roots and either burning them or burying them with quicklime ; wild crucifers should be destroyed. Oviposition in seed-beds may be prevented by strewing a mixture of

1 part sulphur, 2 parts soot and 2 parts gypsum, or one of gypsum containing 2 per cent. of creosote. Older plants may be protected by painting the stem with milk of lime.

Trabajos de las Estaciones de Patología vegetal. [Work done at the Spanish Stations for Plant Pathology.]—*Bol. Estación Pat. veg.*, i, no. 3, pp. 107–113. Madrid, September 1926.

At Madrid the natural enemies of locusts are being studied, the Clerid, *Trichodes amnios*, F., and numerous Dipterous larvae having been obtained from egg-capsules from Badajoz. An unidentified Dipterous parasite was obtained from an adult female of *Dociostaurus* from Jaén. Pests reported included the larvae of *Psyche* sp. in meadows; *Plagiodera versicolor*, Laich., infesting osier willows; and *Earias insulana*, Boisd., on carob beans [*Ceratonia siliqua*].

At Barcelona the Chalcid, *Aphelinus mali*, Hald., imported from Italy and Uruguay, was successfully established against *Eriosoma lanigerum* Hausm., and the Coccinellid, *Novius cardinalis*, Muls., was distributed against *Icerya purchasi*, Mask. Methods are being studied for combating *Aglaope infausta*, L., attacking almonds. There was a severe infestation of peaches, cherries and figs by *Ceratitis capitata*, Wied. Several parasites of the olive fly, *Dacus oleae*, Gmel., have been found and are being examined.

At Almeria the biology of *C. capitata* and the measures to be taken against it are being investigated. The larvae of *Vesperus xatarti* Muls., are common in ground planted with grape-vines, and in the drier soils carbon bisulphide, at the rate of 175 lb. an acre, proved satisfactory. The biology of *Carpomyia incompleta*, Becker, a common pest of jujubes [*Zizyphus*] is being investigated.

At Valencia oranges were attacked by the Lasiocampid, *Taragama repanda*, Hb., *Otiorrhynchus cribricollis*, Gyll., and *Ceroplastes sinensis* DelG. *Novius cardinalis* was distributed for use against *I. purchasi* and *Cryptolaemus montrouzieri*, Muls., is to be imported from California against *Pseudococcus citri*, Risso.

FEYTAUD (J.). **Les Insectes du Noyer.**—*Rev. Zool. agric. & appl.*, xxv, nos. 7 & 8, pp. 97–102 & 121–128, 2 figs., Bordeaux, 1926.

This popular account of the insect pests associated with the walnut tree and its fruit is largely taken from American sources.

SAUNDERS (W. H.). **Investigations into Insecticides for Root Mealy Bug and Root Aphis.**—*Ann. App. Biol.*, xiii, no. 4, pp. 495–501, 5 refs. Cambridge, November 1926.

This paper summarises the results of experiments to discover insecticides suitable for the treatment of pot plants for the control of Aphids and Coccids on the roots; the insects concerned were two mealybugs, *Ripersia terrestris*, Newst., and a closely related species [*Rhizoecus dianthi*, Green (see *R.A.E.*, A, xiv, 596)] on numerous greenhouse plants, especially *Acacia* spp., and the lettuce root aphis, *Pemphigus bursarius*, L. (*lactucarius*, Pass.), on *Primula* spp. and *Chrysanthemum leucanthemum*. The mealybugs attack the roots of greenhouse plants thoughout the year; the females are viviparous, and the nymphs leave the ovisacs and become independent soon after birth; both nymphs and adults wander actively over the roots, causing serious damage by attacking the youngest, and move freely from pot to pot. Only wingless viviparous females of *P. bursarius* were found; their habits are similar to those of the mealybugs, and they cause considerable damage to *Primula* spp. both in pots and in rockeries, attacking the younger roots particularly.

The effect of 42 liquids on *Acacia dealbata* was tested, either by removing the plants from their pots and injecting 2 cc. into the soil ball at two opposite points about 2 ins. below the surface, or by applying 20 cc. of a 10 per cent. solution or emulsion to a potted plant; 23 of the 30 substances applied by the first method and 6 of the 12 applied by the second killed the plants. Some of the substances found to be harmless to the plants and some others were applied by one or other of the above methods to plants of *A. dealbata* attacked by mealybugs; four of the most promising, a preparation of tetrachlorethane, trichlorethylene emulsion, potassium sulphocarbonate, and pyridine, all at a strength of 1 per cent., were applied to various other plants in pots by the second method, and in every case killed the mealybugs without injuring the plants; pyridine, however, is unsuitable for use on account of its highly offensive odour. Several of the liquids that proved harmless to plants by the first method were injected and killed the mealybugs without injuring the plants, though this method is probably less practicable for general use. The Aphid, *P. bursarius*, is controlled by the same treatments as the mealybugs.

MORLAND (D.). **On the Microscopic Examination of Bees for Acari.**—*Ann. App. Biol.*, xiii, no. 4, pp. 502–505, 2 figs., 6 refs. Cambridge, November 1925.

A method of preparing bees for microscopic examination for the presence in the tracheae of the mite [*Acarapis woodi*, Rennie] that causes acarine disease is described, and a method of recording the results of examinations is explained. The degree of infestation in conjunction with the degree of discolouration of the tracheae indicates to some extent the age of the infestation; heavy invasion by mites with only slight bronzing of the tubes suggests recent infestation making active progress; slight infestation with dark bronzing suggests infestation of long standing not making much progress.

LEES (A. H.). **Insect Attack and the Internal Condition of the Plant.**—*Ann. App. Biol.*, xiii, no. 4, pp. 506–515, 19 refs. Cambridge, November 1926.

Certain factors that act as natural checks on the increase of injurious insects, such as weather conditions, natural enemies, entomogenous fungi and hereditary resistance of the plant, are well recognised, but there is one to which the author considers that insufficient attention has been paid in the past, namely "endurance," which is the term applied to resistance in plants due to internal conditions produced by variable external conditions, and not to inherited characters. The object of this paper is to suggest that there is a profitable field for investigation on this subject, which calls for close collaboration between entomologists and biochemists.

To illustrate his argument the author cites a number of cases, some of which have been noticed [*R.A.E.*, A, v, 160; ix, 205;

xi, 275; etc.], in which alteration of certain external conditions o plants has had the effect either of increasing or of decreasing thei resistance to insect attack. In plum orchards the author observed tha the distribution of trees attacked by *Scolytus mali*, Bechst. (*pruni*, Ratz. was sporadic, and that the pest only appeared to spread to trees tha had received some check, usually associated with the fungus producin the condition known as " die-back," but sometimes caused by mechanical injury. In Egypt berseem (*Trifolium alexandrinum*) is much mor susceptible to Aphid attack in heavily irrigated or low-lying fields, i which it makes luxuriant growth. In England apple and plum tree are more susceptible to Aphid attack when grown in arable land tha in grass land, and bearing trees have been observed to be more susceptible in the spring than non-bearing ones. G. C. Maltby has recorde that the application of farmyard manure in the autumn at the rate o 30 tons to the acre to plum trees in two different parts of an orchard i consecutive years resulted, in each case, in increased susceptibility o the trees to plum leaf-curling aphis, *Anuraphis helichrysi*, Kalt. (*prunina* Wlk.) two springs later.

It is concluded that in all the cases considered such operations a irrigation and manuring cause a change in the internal state of the plant which influences the attacking insects, although at present it i impossible to ascertain the nature of such changes. It appears, however, that internal water supply or nitrogen or both provide condition favourable to insects such as Aphids, which are capable of producin many generations in a short time. In the case of apple trees, it ha been shown that bearing spurs contain more nitrogen than non-bearin spurs during the spring and summer, and the same probably applies t plums. It is possible that the reproductive capacity of Aphids i increased by an abundant supply of nitrogenous food. The increase susceptibility of manured plum trees to *A. helichrysi* may be due, no directly to the effect of the manure, but to increase in the water-holdin power of the soil and resulting greater root development, which produc conditions similar to those that follow irrigation.

GOWDEY (C. C.). **The Banana Fruit-scarring Beetle** (*Colaspi hyperchlora*, **Lef.**).—*Bull. Ent. Res.*, xvii, pt. 2, p. 137. London October 1926.

During recent years, banana plantations in some parts of tropica America have been somewhat severely attacked by a Eumolpid beetl *Colaspis hyperchlora*, Lef., which has been recorded from Colombia British Guiana, Panama, Costa Rica, Guatemala, Nicaragua, Britis Honduras and Mexico.

The duration of the immature stages, which are briefly described, is Egg, 7–9 days; larva, 20–22 days; pupa, 7–10 days. There ar apparently four broods, which appear towards the beginning of April the end of June, the end of August and the end of October or beginnin of November.

The eggs are laid singly or in clusters of 5–45 in cavities gnawed b the female in the leaf-sheath of bananas near the crown just above th surface of the ground or in the surface roots, in natural depressions o the surface roots and on the surface roots of the old " mats." Th larvae feed on the young roots and the soft epidermal tissue of th older roots, into which they tunnel, but apparently cause no perceptibl injury. The pupae are found in the soil at a depth of 2–3 inches within a radius of 3 feet from the "mat," often in cavities around the dead roots.

The optimum conditions for the development of this insect are poor drainage, heavy soil, poor cultivation and dense shade. The transportation of the immature stages on suckers is probably the chief means of dissemination, though adults are capable of flying considerable distances and may also be carried on bunches of fruit.

Though the adults attack the young uncurled leaves, the damage is not serious enough to affect the growth of the plant, and the chief loss is due to their feeding on the fruit; for although the injury does not extend into the edible portion, the scars render the fruit unsaleable. Other recorded food-plants are rose bushes, *Lantana camara*, *Antigonon leptosus* and *Coccoloba* sp.

MUMFORD (E. P.). **Notes on the Froghopper Blight of Sugar-cane in Trinidad.**—*Bull. Ent. Res.*, xvii, pt. 2, pp. 139–150, 47 refs. London, October 1926; [abridged as :] **The Froghopper Blight.**—*West India Committee Circ.*, lxi, nos. 714 & 715, pp. 49–50 & 73–74, 7 refs. London, 1926.

This is an elaboration of two previous papers in which the effects of unfavourable climatic and soil conditions in lowering the natural resistance of plants to attack by pests was discussed [*R.A.E.*, A, xiv, 125, 461]. Although not based on personal observations, a preliminary survey is made of work already done on the froghopper, *Tomaspis saccharina*, Dist. [*cf. R.A.E.*, A, ix, 261], and suggestions are made for new lines of enquiry. The importance of water-balance in promoting resistance of the plant to attack is particularly stressed, and in this connection the root-system of various varieties of sugar-cane in different parts of the world is discussed. Since this was written two papers by Withycombe have dealt with this point [*R.A.E.*, A, xiv, 186, 546] and bear out the suggestions here put forward.

During the day, the excess sucrose ($C_{12}H_{22}O_{11}$) is stored in the leaf of the sugar-cane in the form of starch, which at night is converted into reducing sugars. It is at night, when these reducing sugars are most abundant, that the froghopper feeds. Disturbances in the metabolism of the plant, caused by conditions such as extreme drought (physiological or actual), are said to result in an increase of reducing sugars as degradation products, and it is suggested that this may be the reason why diseased or damaged canes are said to be more attractive to the froghopper.

Root disease, caused by the fungi, *Marasmius* and *Odontia*, is also known to attack those plants that are unhealthy (*i.e.*, unable to resist adverse environmental conditions), so that a plant already suffering from water-shortage may have its capacity for root absorbtion lowered by this disease, and become still more liable to infestation by froghoppers. On the other hand, an unhealthy cane may be infested by froghoppers and consequently be unable to resist an attack of the fungi.

DAVIES (W. M.). **Collembola injuring Leaves of Mangold Seedlings.**—*Bull. Ent. Res.*, xvii, pt. 2, pp. 159–162, 2 pls., 5 refs. London, October 1926.

Although the economic position of Collembola has not yet been fully established, *Smynthurus* (*Bourletiella*) *hortensis*, Fitch, is the most important. It attacks a very great variety of plants; lists of its food-plants in Britain and Canada are given.

Damage to mangels has been previously reported [*R.A.E.*, A, xi, 57; xiii, 424], and this paper deals with a method of control that was successfully employed. Leaf damage was reported on 31st May 1926, before the roots had appeared above ground, and practically 100 per cent. of the plants were found to be infested with *S. hortensis.* The ability of such small insects to cause comparatively extensive injury is due to their habit of feeding in groups. The attraction of exuding plant juices doubtless led to the formation of this habit, so that the leaves are not only bitten, but the wounds are kept open and excessive bleeding ensues.

Field conditions in the early morning were found to be more constant for comparative work, and observations were made at 6.30 a.m. on 1st June. As the insects jump at the slightest disturbance, counts were made by placing a glass cylinder, 3½ inches in diameter by 6 inches in height, quickly and quietly over a group of plants, four being the number aimed at, and counting the insects knocked off on to the soil inside. Twenty random counts gave an average of 19·7 per unit area (approx. 9 sq. inches) or about 1,500,000 per acre.

The first treatment was made with paraffin-soaked sacks trailed behind a flat horse-roller; few insects were observed on the treated plants, while those on the ground were very active, but heavy rain fell in the night, and it was evident that the repellent effect of the paraffin had disappeared. Efforts were then made to catch the insects on tarred sacks trailed over the ridges so that they were caught on the tar as they jumped. White varnish, which was almost as successful as the tar, was used to show more clearly the large number of insects caught.

The most successful improvised apparatus used consisted of two Planet hoes fastened together by two crossbars, long enough to cover two ridges in width, over which was hung a sack, tarred up to 9 inches from the bottom. This tarred surface just trailed above the two ridges and a similarly tarred sack was hung perpendicularly behind. In order to avoid disturbing the Collembola by shadow, it was found essential to push this contrivance. This treatment reduced the infestation so much that it may be said to have saved the crop. Other contrivances for carrying the tarred sacks are mentioned, one of the best consisting of a pair of old bicycle wheels joined by an iron axle to which were bolted two L-shaped brackets, adjustable for different heights of ridges, the horizontal arms projecting forwards and holding on the underside an arch-shaped wooden box. A piece of strong string was hung loosely across the inside of the archway and thus trailed over the plants just in front of the sacking, which forms the back of the arch. The entire box and sacking were smeared with tar, and the whole contrivance was pushed by means of a fairly long handle. This machine has also been used successfully against flea-beetles, but since they jump higher than Collembola, a piece of 3-ply wood smeared with tar is fixed in a slanting position on the top of the box.

Wilkinson (D. S.). **The Cyprus Processionary Caterpillar** (*Thaumetopoea wilkinsoni*, **Tams**).—*Bull. Ent. Res.*, xvii, pt. 2, pp. 163–182, 3 pls., 4 tables, 6 refs. London, October 1926.

The known species of *Thaumetopoea* (*Cnethocampa*) are briefly reviewed, and a list of their natural enemies is given. The bionomics of *T. wilkinsoni*, Tams, are described and measures of control suggested. Re-afforestation in Cyprus being an urgent necessity, this pest is of great economic importance, since one colony of larvae is sufficient to strip, and if the late rains fail, to kill a small tree, and all stands of young trees suffer severely from its attacks.

T. wilkinsoni is known only in Cyprus, where it attacks all species of pine, but chiefly *Pinus halepensis*. In the plains the adults emerge from the end of August to the beginning of October. The eggs are laid, shortly after emergence, in cylindrical masses round pine needles, the masses averaging 150 eggs. Only one mass is laid by each female. The incubation period is about 45 days. The five larval instars are described, as well as the differences in the habits and nests in the various instars. Pupation, which commences in the plains about the middle of March, takes place in the ground at a depth of ¼ to 3 inches, the pupal life lasting all through the hot weather.

The Encyrtid, *Ooencyrtus pityocampae*, Mercet, was bred from eggs of *T. wilkinsoni* in October and November. A second brood appeared in May (which must either have been a true second brood from adults that had escaped detection, or cases of delayed emergence), and as there would have been no eggs of *T. wilkinsoni* until the following August, it is apparent that these adults must oviposit in an alternative host. The parasitism was found to be as high as 17·8 per cent.

Anastatus bifasciatus, Boy., also emerged from the same egg-masses, at the same time as *O. pityocampae*, while a second brood also appeared in May, and it is suggested that it is a hyperparasite.

Adults of the Ichneumonid, *Erigorgus melanobatus*, Grav., were observed in February, March and April ovipositing in any exposed larvae and even going inside the nest to attack the caterpillars at rest there. The parasite pupates in the cocoon of its host and emerges in the following spring.

Three Tachinids, *Compsilura concinnata*, Mg., *Tricholyga segregata*, Rond., and *Ceratochaeta caudata*, Rond., have been shown sometimes to occasion a parasitism of at least 30 per cent. Adults of at least one species emerged between 25th October and 10th December from larvae attacked the previous March; and in the middle of March from nests taken the previous December. The pupae of these Tachinids are very highly parasitised by a Pteromalid, *Dibrachys boucheanus*, Ratz.

It is suggested as a control measure that isolation areas be constructed by placing continuous troughs at least 4 inches broad at the top filled with water round small groups of trees. Large quantities of nests should be collected and attached to the trees in the isolation areas, so that the larvae may mature and pupate. Some time before the adults are expected to emerge, the whole of the ground within the isolation areas should be entirely covered with some material strong enough to prevent any moths from escaping. After all the moths have emerged and died, it should be removed to allow the escape of Ichneumonid parasites. After the pupation of the caterpillars, the collection of the disintegrating nests should still be assiduously carried on so that the Tachinid parasites pupating inside may not fall to the ground and be destroyed by predatory insects. These nests should be stored in rows, under shelters standing on uprights in concrete beds, so shaped as to hold a pool of water or oil as a protection against ants.

Bodenheimer (F. S.). **Second Note on the Coccidae of Palestine.**—*Bull. Ent. Res.*, xvii, pt. 2, pp. 189–192, 4 figs. London, October 1926.

In this addition to the author's previous paper [*R.A.E.*, A, xii, 460], 13 more species are recorded, bringing the total to 79. They include *Pulvinaria pistaciae*, sp. n., on the lower surface of the leaves and on the twigs of *Pistacia palestina*, and *Pseudococcus daganiae*, sp. n. A footnote by Mr. F. Laing points out that the last-named is better placed in *Trionymus*.

Smee (C.). **Report of the Entomologist.**—*Nyasaland: Ann. Rept. Dept. Agric. 1925*, pp. 9–10. Zomba, 1926.

Owing to the discovery of *Platyedra gossypiella*, Saund. (pink bollworm) in North Nyasa the growing of cotton there has been prohibited, and certain other quarantine restrictions are being enforced in this connection, which are here briefly outlined.

Ferrière (C.). **Un nouveau cas de phorésie : Trichogrammides sur Sauterelles.**—*Treubia*, viii, no. 3–4, pp. 274–277, 1 pl., 1 fig. Buitenzorg, July 1926. [Recd. November 1926.]

A Trichogrammatid, *Oligosita xiphidii*, sp. n., is described from Java that attaches itself to the wings of a Tettigoniid, *Xiphidion longipenne*, de Haan.

Horváth (G.). **Hemipterologische Notizen aus Niederländisch-Indien.** [Notes on Rhynchota from the Dutch East Indies.]—*Treubia*, viii, no. 3–4, pp. 327–333, 3 figs. Buitenzorg, July 1926. [Recd. November 1926.]

The Capsid attacking tobacco in Sumatra, recorded as *Dicyphus* (*Gallobelicus*) *nicotianae*, Kon. [*R.A.E.*, A, x, 570], is now stated to be identical with *Engytatus tenuis*, Reut.

An editorial foot-note, however, points out that Fulmek has meantime differentiated this Sumatran species from the Javanese and described it as *Dicyphus nocivus*, sp. n. [A, xiv, 327].

Marshall (G. A. K.). **On New Species of Curculionidae (Coleopt.) from Java and Sumatra.**—*Treubia*, viii, no. 3–4, pp. 342–351. Buitenzorg, July 1926. [Recd. November 1926.]

The species described include *Cryptorrhynchus goniocnemis*, sp. n. on mango in Sumatra, and *Pentarthrum musae*, sp. n., found in South Africa at the roots of bananas imported from Java.

Grandi (G.). **Hyménoptères sycophiles récoltées à Sumatra et à Java par E. Jacobson. (21^{me} contribution à la connaissance des insectes des figuiers.)**—*Treubia*, viii, no. 3–4, pp. 352–364. Buitenzorg, July 1926. [Recd. November 1926.]

This is a preliminary description of seven new species of *Blastophaga*, one of *Eupristina* and five of *Philotrypesis* from figs (*Ficus* spp.) in Java and Sumatra.

Takahashi (R.). **Some Aphididae of Sumatra. Part 2.**—*Treubia*, viii, no. 3–4, pp. 462–466. Buitenzorg, July 1926. [Recd. November 1926.]

The first part of this list has already been noticed [*R.A.E.*, A, xiv, 326]. The species recorded here are *Aphis saliceti*, Kalt., on *Salix*, *A. tavaresi*, DelG., on *Citrus*, *Toxoptera aurantii*, Boy., on a Euphorbiaceous plant, and *Oregma sumatrensis*, sp. n., on bamboo.

Takahashi (R.). **The Aphids of *Myzocallis* infesting the Bamboo.**—*Proc. Ent. Soc. Wash.*, xxviii, no. 7, pp. 159–162, 8 figs. Washington, D.C., October 1926.

A key is given to the winged viviparous females of the 7 species of *Myzocallis* recorded from bamboo, which include *M. taiwanus*, sp. n., in Formosa. Notes on the distribution are also given.

Porter (C. E.). **Notas acerca de un Brúquido chileno.** [Notes on a Chilean Bruchid.]—*Rev. chil. Hist. nat.*, xxix, p. 286. Santiago de Chile, 1925. [Recd. November 1926.]

Bruchus elegans, Blanch., is recorded from seeds of *Lithraea caustica* in Chile.

Principales parasitos que dañan el cultivo de la alfalfa en la Republica Argentina. [The Chief Enemies of Lucerne in Argentina.]—*Argentina Minist. Agric.*, [Circ.] 645, 19 pp., 3 pls. Buenos Aires, 23rd September 1926.

The chief pest of lucerne in Argentina is the lucerne butterfly, *Colias lesbia*, F., an account of which has already been noticed [*R.A.E.*, A, xii, 224]. Other Lepidoptera are *Phytometra* (*Rachiplusia*) *nu*, Gn., *Tatochila autodice*, Hb., *Heliothis obsoleta*, F., *Cirphis* (*Heliophila*) *unipuncta*, Haw., *Laphygma frugiperda*, S. & A., and *Prodenia ornithogalli*, Gn. The cutworm, *Lycophotia* (*Peridroma*) *margaritosa*, Haw., is controlled by the use of a poisoned bran bait and deep ploughing, and these methods are also employed against a grasshopper, *Dichroplus* sp. Crop rotation is the only measure against the larvae of *Diloboderus abderus*, Sturm. Against *Epicauta adspersa*, Klug, a spray containing ½ per cent. Paris green and ½ per cent. recently slaked lime may be used. Against the mite, *Tetranychus telarius*, L., spraying with tobacco-soap is quite effective, or the fields may be dusted with sulphur. In the Rio Negro valley a thrips, *Frankliniella* sp., attacks the lucerne flowers and thus interferes with the production of seed; the only practicable measure is cutting the lucerne as low as possible in the second half of November in order to destroy the eggs of the first generation. During the past six years most of the losses in the lucerne fields in Paraná have been due to a Nematode, *Tylenchus dipsaci*, Kühn (*devastatrix*, Kühn). Crop rotation, deep ploughing and the avoidance of infested straw as manure are the measures advocated.

de Magalhães (P. S.). *Dorcatoma bibliophagum* **(O caruncho dos nossos livros).** [*D. bibliophagum*, the Beetle attacking our Books.]—45 pp., 2 pls. Rio de Janeiro, 1926.

This is a series of reprints discussing the correct name of the Anobiid infesting books in Brazil, which the author considers to be *Dorcatoma bibliophagum*, de Magalhães.

La campaña contra la langosta. [Work against Locusts.]—*Bol. Agric., Ind. y Com. Guatemala*, v, no. 5 (May 1926), pp. 172–173. Guatemala, September 1926.

In Guatemala work against locusts had to be stopped in August because the hoppers had transformed into adults. The latter were, however, extensively parasitised, chiefly by the flies, *Tachinophyto gilvipes*, Coq., and *Sarcophaga acridiorum*, Weyenb. Both have about six generations for each one of the locusts.

Ogilvie (L.). **Report of the Plant Pathologist for the Year 1925.**—*Bermuda: Rept. Dept. Agric. 1925*, pp. 36–63. Bermuda, 1926.

Some of the insects dealt with in this report have been recorded in previous ones [*R.A.E.*, A, xii, 235 ; xiii, 137, 455 ; xiv, 468]. Banana pests included *Ceratitis capitata*, Wied. (Mediterranean fruit-fly), and a mite, *Anychus latus*, Can., which causes silvering of the leaves. The disease of bananas known as " black tip " was prevalent during a spell of dry weather ; it begins as an excessive gumming at the point of breaking of the perianth segments, which attracts *Drosophila* spp. ; the tip of the fruit becomes black and is frequently covered with Gamasid mites, *Hypoaspis* sp. ; the black discolouration extends to the skin of the fruit, which is subsequently attacked by the larvae of *Araecerus fasciculatus*, DeG., and other insects, these being important in causing the fruit to rot ; in the later stages the fruit is frequently attacked by the larvae of the Ortalid, *Chaetopsis aenea*, Wied. There is no evidence that any of these insects is the primary cause of the disease, and it is thought that it is of physiological origin.

Beans, especially near fruit-trees, were heavily infested by *Ceratitis capitata* ; the eggs are inserted through the pods, on the inner surface of which they are laid, and the larvae tunnel in the pods, causing them to rot, and discolour the seeds, which are not, however, attacked. Other pests of beans included a Capsid, *Lygus* sp., which caused severe damage to leaves and shoots ; a thrips, *Frankliniella insularis*, Frankl., which attacks both leaves and flowers ; and *Bruchus pisorum*, L., which lays its eggs on the green pods in the field, the larvae feeding in the seeds and producing adults that emerge from them when they are stored. Cowpeas were damaged by the larvae of *Phytometra oo*, Cram., which was also injurious to soy-beans [*Glycine hispida*], potatoes and seedling sweet peas, and by *Empoasca fabae*, Harr. (*mali*, LeB.). *Hymenia fascialis*, Cram. (beet webworm) breeds commonly on *Portulaca oleracea* (wild purslane), which is also a food-plant of *Nysius ericae*, Schill. (false chinch bug), which caused severe injury to potatoes in 1921.

The most important pests of *Citrus* are the purple scale [*Lepidosaphes beckii*, Newm.] and the cloudy-winged whitefly [*Dialeurodes citrifolii*, Morg.], the control of which by spraying at least three times a year with oil emulsion is absolutely essential for the successful growing of these trees; the yellow fungus [*Aschersonia goldiana* (*flavocitrina* of Florida writers)], introduced from Florida in July 1924 for the control of *D. citrifolii*, was well established in November 1925 in the orchard on the trees of which it was sprayed.

Pests of cucurbits included *Diaphania* (*Margaronia*) *hyalinata*, L., the larvae, which feed first on the leaves and later in the fruits of melons, being also found on the leaves of *Clerodendron fragrans* and *Acalypha*; *Empoasca fabae* on water-melons; the woodlouse, *Armadillidium vulgare*, Latr., boring into pumpkins; and the Coreid, *Anasa scorbutica*, F. Egg-plants [*Solanum melongena*] and potatoes were damaged by the Pyralid, *Psara periusalis*, Wlk., which also attacks tomatos, ornamental species of *Solanum* and *S. nigrum*. *Aphis gossypii*, Glov., also occurred on egg-plants. *Pseudococcus citri*, Risso, was injurious to the sprouts of potato tubers stored throughout the summer; it has also been found at the base of lily bulbs and celery plants, to which it does not apparently do any damage, and on the leaves of *Citrus* and shoots of *Croton*; potato tubers attacked by *P. citri* may produce healthy plants if the sprouts are not noticeably injured when they are planted; care should be taken that tubers are free from infestation when stored, and to prevent infestation during storage they should be protected from ants. Various methods of destroying the mealybugs on the tubers were tested; soaking the tubers in fish-oil soap solution, ½ oz. to 1 gal. for 1 hour at 70° F. killed about 80 per cent., and similar results were obtained by dusting with nicotine sulphate (2 per cent.) and sulphur dust in the sun, the temperature being about 110° F., and by fumigating for 1 hour with hydrocyanic acid gas, using 1 oz. sodium cyanide per 100 cu. ft., but dusting with 6 per cent. nicotine sulphate under similar conditions was not effective. Most of the adults survived submersion in water at 70° F. for 24 hours, but very good results were obtained by washing the tubers in a strong jet of water; submersion for 2 hours in 40 per cent. nicotine sulphate, 1–400, killed 60 per cent. of the mealybugs, and the addition of ½ oz. fish-oil soap to a gal. gave very good results; tubers soaked in lubricating oil emulsion, 1–40, for 1 hour were killed. Cruciferous crops were damaged by *Brevicoryne* (*Aphis*) *brassicae*, L., and by a leaf-miner, *Agromyza pusilla*, Mg., which is often responsible for the spread of black rot bacteria through the leaves. Onions were severely damaged by *Thrips tabaci*, Lind., in February, but the attack was checked by heavy rains at the end of the month; late maturing onions are more liable to injury by this pest than early ones, as it is favoured by high temperatures. The weevil, *Euscepes batatae*, Waterh., was found on sweet potato tubers, but is not considered a pest of much importance. *Anuraphis tulipae*, Boyer, attacks the roots of celery, carrots and parsley, but apparently does little damage.

Pests of loquats [*Eriobotrya japonica*] included *Aphis pomi*, DeG., on the shoots, accompanied by sooty moulds, and a weevil, *Diaprepes esuriens*, Gyl., on the leaves. The Coccid, *Morganella maskelli*, Ckll., was found on the roots of oleander several feet below the surface of the ground. Strawberry fruit in one locality was injured by a Cydnid bug, *Pangaeus bilineatus*, Say, which is common in Bermuda soils.

Considerable attention was paid to the diseases and pests of *Lilium longiflorum* var. *harrisi* (Bermuda lily); the condition described as "basal rot" was found to be invariably associated with the bulb mite, *Rhizoglyphus hyacinthi*, Banks. This mite is generally supposed to be incapable of causing primary injury to bulbs [*cf. R.A.E.*, A, xiii, 591], but otherwise entirely healthy *Narcissus* bulbs growing amongst damaged ones were found to be attacked by it, and it is attracted to decaying vegetable matter, such as bruised scales of lily bulbs or necrotic areas on them caused by the black scale fungus (*Volutella* sp.), and subsequently enters the healthy tissues; withered or injured scales should, therefore, be removed before storing and before planting, and in ordinary soil a callus will quickly form over the exposed part. Fumigation for 36 hours with paradichlorobenzene, 3 gm. per cu. ft., killed all mites in the bulbs but not all the eggs; soaking in mercury bichloride, 1 : 1,000, for half-an-hour killed about 80 per cent. of the mites. An Aphid allied to *Aphis gossypii* occurs on lilies throughout the season, but is especially prevalent early in the year, being largely controlled in the warmer months by the Braconid, *Lysiphlebus* (*Aphidius*) *testaceipes*, Cress., the Syrphids, *Allograpta obliqua*, Say, and *Mesograpta* (*Toxomerus*) *marginata*, Say, and Coccinellids, of which only three species, *Novius cardinalis*, Muls., *Cycloneda* (*Coccinella*) *munda*, Say, and *Scymnus terminatus*, Say, occur in Bermuda. There is strong evidence that the disease known as " yellow flat " is caused by a virus transmitted by the Aphid, and it is probable that it also transmits a mosaic disease of the lily. It can be controlled by dusting with nicotine or spraying with 40 per cent. nicotine sulphate, 1–800, containing 3–5 lb. soap to 100 gals., during the heat of the day. Some damage to lilies in April and shortly after planting was caused by white grubs, *Ligyrus* sp., in land that had been allowed to go to grass; this damage could be largely avoided by growing leguminous crops in the summer and by deep and early ploughing. Pests of miscellaneous ornamental plants included the Geometrid, *Acidalia stellata*, Gn., on *Bougainvillea*, the Coccids, *Fiorinia fioriniae*, Targ., and *Eucalymnatus* (*Lecanium*) *tessellatus*, Sign., on coconut and other palms, the Sphingid, *Erinnyis ello*, L., on *Poinsettia*, and the Coccids, *Diaspis zamiae*, Morg., and *Pinnaspis aspidistrae*, Sign., on the leaves of sago palms (*Cycas revoluta*). Lizards captured at the Agricultural Station were *Eumeces longirostris*, an endemic species, and *Anolis* sp., probably introduced in 1905; examination of the alimentary canal of the latter showed ants, mainly *Pheidole megacephala*, F., and other small insects to be the principal food; it is suggested that these lizards should be established in parts of the islands where they are uncommon.

Pests intercepted included *Pseudococcus adonidum*, L. (*longispinus*, Targ.), on lime fruit and *Aspidiotus destructor*, Sign., from the West Indies, and *Eriosoma lanigerum*, Hausm., on plants from the Azores. During the year legislation came into force prohibiting the importation from the West Indies and Bahamas of citrus plants and citrus fruits, unless free from leaves, twigs and other portions of the plant, on account of *Aleurocanthus woglumi*, Ashby, and, from the United States, Cuba, Bahamas, British Guiana, Jamaica, Panama Canal Zone and Porto Rico, of sweet potatoes, on account of *Cylas formicarius*, Ol.

[Skeete (C. C.).] **Entomological Work.**—*Rept. Dept. Agric. Barbados, 1925–26*, pp. 9-10. Barbados, 1926.

The attacks of *Diaprepes abbreviatus*, L. (root borer) and *Lachnosterna smithi*, Arrow (brown hardback) on sugar-cane have apparently not varied from previous years. On some estates as many as 50,000 to 100,000 beetles a week were collected, but on others the work was neglected.

Diatraea saccharalis, F. (moth borer) appears to be increasing in certain localities and causes considerable damage. Where termites are known to be abundant, it is suggested that only plants dipped in lead acetate or with cut ends protected with tar should be planted. White arsenic, mixed with sawdust, sugar, or manure, or, perhaps even better, with some of the termites themselves, is an effective bait.

Platyedra (*Pectinophora*) *gossypiella*, Saund., caused heavy losses to cotton generally; in some districts over 70 per cent. of bolls were attacked. Other cotton pests, such as *Alabama argillacea*, Hb. (cotton worm), *Eriophyes gossypii*, Banks (leaf-blister mite) and *Aphis gossypii*, Glov., caused on the whole very little damage.

BRUNER (S. C.) & BROMLEY (S. W.). **The Cyanogas Calcium Cyanide Treatment for the Cuban Leaf-cutting Ant.**—*Res. Devmpt. Cyanogas Calcium Cyanide*, Sect. 4, pp. 85–91, 2 figs. New York, N. Y., Amer. Cyanamid Co., 30th September 1926.

Experiments with calcium cyanide for the control of the leaf-cutting ant, *Atta insularis*, Guér., in Cuba are described. The results were substantially the same as those obtained in Brazil against *A. sexdens*, L. [*R.A.E.*, A, xiv, 80], except that in Cuba the larger foot-pump type of duster was found to be better adapted to the treatment of the nests.

As a rule from ½ to 5 lb. of the dust are necessary for one treatment, about 15 minutes being required for the application of 1 lb. Nests of moderate size may be successfully treated with one application; in the case of the larger ones, however, two or three applications are usually required. The nest should be inspected one or two weeks after treatment, for if the queen has survived, the ants will be becoming active by this time.

HOPPING (G. R.). **A New *Melasis* with a Key to the Species (Coleoptera).**—*Canad. Ent.*, lviii, no. 9, pp. 225–228, 1 fig., 6 refs. Orillia, Ont., September 1926.

Melasis tsugae, sp. n., is recorded as breeding in a fallen western hemlock (*Tsuga heterophylla*) on the coast of British Columbia.

FELT (E. P.). **A New Spruce Gall Midge (Itonididae).**—*Canad. Ent.*, lviii, no. 9, pp. 229–230. Orillia, Ont., September 1926.

Phytophaga piceae, sp. n., recorded from Quebec and Manitoba, attacks the smaller twigs of white spruce (*Picea canadensis*), which may be seriously deformed by this midge. The injury appears to be primarily an infestation of the basal portion of the needles.

CURRAN (C. H.). **A New Sawfly infesting Cottonwood in British Columbia. (Hymenoptera: Tenthredinidae.)**—*Canad. Ent.*, lviii. no. 9. pp. 233–234. Orillia, Ont., September 1926.

Pteronus (*Pteronidea*) *nigriventris*, sp. n., was found during the spring of 1926 causing considerable damage to cottonwoods [*Populus*] in British Columbia.

Hebard (M.). **A Key to the North American Genera of the Acridinae which occur north of Mexico (Orthoptera, Acrididae).**—*Trans. Amer. Ent. Soc.*, lii, no. 2, pp. 47–59, 3 refs. Philadelphia, Pa., June 1926.

This key is of a preliminary character.

Roark (R. C.). **Review of United States Patents relating to Insecticides and Fungicides issued during January, February and March, 1926.**—*U.S. Dept. Agric.*, Bur. Chem., 10 pp. typescript. [Washington, D.C., 1926.]

Abstracts of the patents relating to insecticides and fungicides issued during the first three months of 1926 are given, in order to bring useful materials and methods to the attention of entomologists and others interested.

Notice of Permit Requirement for Entry of Chestnuts, Walnuts, Filberts, Cobnuts and Acorns from Europe.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 2 pp. typescript. Washington, D.C., 22nd September 1926.

In accordance with the provision made in amendment no. 3 to regulations supplemental to Notice of Quarantine no. 56 [*R.A.E.*, A, xiii, 238] the importation without a permit from Europe of chestnuts, walnuts, filberts, cobnuts and acorns, which were not previously subject to the general prohibition of this quarantine [*R.A.E.*, A, xii, 118], is prohibited, from 1st October 1926, on account of *Cydia* (*Carpocapsa*) *splendana*, Hb., and *Balaninus* spp.

Quarantine on account of the Thurberia Weevil. Notice of Quarantine, no. 61, with Supplemental Rules and Regulations.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 4 pp. Washington, D.C., 2nd July 1926.

On account of *Anthonomus grandis thurberiae*, Pierce, no cotton, or cotton products or articles that may have come in contact with cotton, or the *Thurberia* plant, or any part of it, may be moved from quarantined areas of the State of Arizona into, or through, any other part of the United States, except under certain rules and regulations providing for inspection, disinfection and certification.

This Quarantine came into force 15th July 1926.

Roark (R. C.). **Chloropicrin. A Bibliography, with Special Reference to the Use of Chloropicrin as an Insecticide (1848 to 1925).**—*U.S. Dept. Agric.*, Chem. Bibliography no. 1, 73 pp. mimeograph. Washington, D.C., 1926.

This bibliography of 287 titles is arranged by authors and has a detailed subject-index.

Watson (J. R.). **Report of Entomologist.**—*Florida Agric. Expt. Sta., Rept. 1924–25*, pp. 36*R*–39*R*. [Gainesville, Fla., 1925.] [Recd. October 1926.]

A short summary is given of the work on the new citrus Aphid [*Aphis pomi*, DeG.], now commonly called the green Aphid [*R.A.E.*, A, xiii, 324]. Considerable attention has been given to the control of Nematodes [*Heterodera radicicola*, Greef]; preliminary tests indicate that twice as much calcium cyanide is required for soil treatment as sodium cyanide [*R.A.E.*, A, xii, 310], so that there is practically no saving in the cost of materials, but less labour is required, as in the case of calcium cyanide only one application without water is necessary. Though by no means completed, the experiments with calcium cyanide for the control of Nematodes on peaches are very promising. Applications of ½ ton to the acre caused injury to the trees, 500–750 lb. being the most satisfactory amount. Better results were obtained with two or four applications than with one; two applications were made in March and July, and the additional ones in May and September. The single application was made at the beginning of March, but possibly better results would have been obtained if it had been made at the beginning of April.

The poison baits for the celery leaf-tyer [*Phlyctaenia rubigalis*, Gn.] were applied with and without nitrobenzene [*R.A.E.*, A, xii, 493], and with and without fruit juice, little difference being noticed as a result. Care must be taken to get the bait down to the heart of the plant where the larvae are; this may be done by hand or by drawing a stick or pole across the celery after the bait has been dropped on the top.

BEYER (A. H.). **Report of the Assistant Entomologist.**—*Florida Agric. Expt. Sta., Rept. 1924–25*, pp. 39*R*–41*R*. [Gainesville, Fla., 1925.] [Recd. October 1926.]

The various insect enemies of pecan studied during the year are recorded under their popular names. At the end of March, as the foliage was beginning to appear, a spray of 4 lb. lead arsenate, 12 lb. lime, 2 lb. calcium caseinate, and 200 U.S. gals. water, was applied to both sides of the foliage, under a pressure of 300 lb. On varieties susceptible to scab, Bordeaux mixture was used instead of the water. At the end of April the infestation of leaf case-bearer [*Acrobasis nebulella*, Riley] was 9 per cent. and of cigar case-bearer [*Coleophora caryaefoliella*, Clem.] 19 per cent. A second application was then made, and the trees were inspected on 29th June, when practically no trace of the insects or scab could be found.

The device previously found so efficient for the application of nicotine sulphate and Bordeaux mixture [*R.A.E.*, A, x, 532] against the bean Jassid [*Empoasca fabae*, Harr. (*mali*, LeB.)] has also been tried for the application of dusts. A series of comparative experiments was conducted with a copper sulphate and lime dust, with the addition of 3 per cent. nicotine. Even when applied thoroughly to the foliage, it did not adhere so well as the Bordeaux mixture. Under the hood of the spraying device the dust was about equal to the spray in the percentage of insects killed, but its effects were not as lasting, as the Bordeaux mixture acts as a repellent.

REINHARD (H. J.). **The Cotton Flea Hopper.**—*Texas Agric. Expt. Sta.*, Bull. 339, 39 pp., 10 figs., 17 refs. College Station, Texas, April 1926.

REINHARD (H. J.). **Control of the Cotton Flea Hopper in Texas.**—*Texas Agric. Expt. Sta.*, Circ. 40, 8 pp., 2 figs. College Station, Texas, July 1926. [Recd. October 1926.]

The first of these papers contains a detailed account of the life-history of *Psallus seriatus*, Reut. (cotton flea-hopper), all stages of which are described, with recommendations for its control ; the second paper is a summary of the first. This Capsid is widely distributed in the United States, from the Atlantic to the Pacific and from Minnesota to the Gulf of Mexico, but attracted no attention as an economic pest until 1920, when it was associated with a new type of damage to cotton in Texas [*R.A.E.*, A, xii, 586]. The author's experiments have proved that *P. seriatus* is responsible for this damage ; cotton plants in the field were covered with cages, into some of which nymphs or adults were introduced, while the others were used as controls. The percentage of small squares shed by plants subjected to attack by the Capsid varied from 15 to 53, the maximum being in a cage into which 1,725 nymphs were introduced over a period of 69 days and the minimum in a cage into which 135 nymphs were introduced over a period of 18 days ; the control plants corresponding to these two shed 3 and 4 per cent., respectively, of their small squares. The damage caused by *P. seriatus* is frequently not uniform ; excessive shedding of squares may take place early in the season when there appear to be few insects, while later in the season, in other fields where the insects are fairly abundant few squares may be affected ; apparently normal plants may be closely associated with others showing every characteristic of injury ; sometimes a badly affected plant may recover sufficiently by the end of the season to bear a normal crop on its upper part. For these and other reasons the theory has been put forward that *P. seriatus* transmits a virus, which is actually responsible for the injury to cotton.

A list of 38 plants on which *P. seriatus* has been found feeding in Texas is given, most of them being succulent weeds ; on six of these including cowpea (*Vigna sinensis*) and watermelon (*Citrullus*), adults only have been seen, when migrating from *Croton* in the autumn, but newly hatched nymphs have been reared to maturity in the laboratory on the remaining 32. The most important food-plants are *Croton* spp., *Monarda fistulosa* and *M. punctata*, the last two being apparently attractive to *P. seriatus* mainly in the black-land area of the State. where damage to cotton is most severe, and in some areas *Helianthus maximiliani* and *Atriplex* sp. *Croton*, *H. maximiliani*, *Atriplex* and cotton are the only plants in which overwintering eggs have been found. Normally cotton appears to be most attractive to *P. seriatus* as a food-plant in the spring and autumn, but it has never been observed to be so severely attacked as *Croton*, *Monarda* and *Atriplex*, and migration from these to cotton is not a definite procedure.

Some of the data on the life-history of *P. seriatus*, which were obtained in the laboratory, have already been noticed [*R.A.E.*, A, xiv, 275] ; *Croton capitatus* was the food-plant used. During the summer months the life-cycle from egg-laying to the emergence of the adult varies from 16 to 29 days, the average during May being 22½ days. The adults mate and begin to oviposit usually 3–4 days after emergence ; both mating and oviposition normally take place at night ; the method of oviposition is described. In captivity adults lived for 14 to 29 days and egg-laying continued for 7 to 18 days, 1–3 eggs a day being usually laid ; in the field these periods are probably considerably longer. The nature of the food as well as temperature affects the development of the nymphs ; nymphs fed on *Croton* leaves became adult in 13–20 days, while others fed on the heads became adult in 9–14 days. The adults take flight when disturbed, and both nymphs and adults are able to jump ; they feed mainly on the tender growing points of the plants, but do not feed at one spot for long. Most nymphs and adults are killed by cold before 15th November, and overwintering eggs may be laid as early as 1st September, although others may hatch in November.

Natural enemies are of little importance in controlling *P. seriatus*; the commonest are probably spiders. The larva of an Erythraeid mite, *Bochartia* sp., is an external parasite of the nymphs. Large numbers of adults of the Coccinellid, *Hippodamia convergens*, Guér., migrated to heavily infested plants of *Croton*, but they did not multiply sufficiently to produce any apparent reduction in the number of nymphs present.

The most important control measure consists of the destruction of weeds that serve as food-plants in and around cotton fields; if these weeds are neither burnt nor ploughed in, they should be pulled up before 1st September, as otherwise hibernating eggs that have been laid will not be affected; weeds in the fields in early spring serve as food-plants before cotton is available. Cotton stalks should be ploughed in during the autumn or winter.

In dusting experiments with various materials sulphur and sulphur-naphthalene both gave excellent results; the latter was slightly more effective but is more expensive and difficult to obtain. Three or four applications of fine sulphur should be made at 10–12 day intervals early in the season, using 12–15 lb. to the acre for each; the adults are not usually killed by sulphur, and if it is necessary to dust later in the season the applications should be made at intervals of 8 days.

HUNTER (W. D.). **The Cotton Hopper, or so-called "Cotton Flea."**—*U.S. Dept. Agric.*, Dept. Circ. 361, 15 pp., 4 figs., 5 refs. Washington, D.C., August 1926.

This is an account of investigations of the cotton hopper, *Psallus seriatus*, Reut., and the injury that it causes to cotton [see preceding paper], made in Southern Texas in 1923 and 1924. The Capsids began to appear on *Monarda clinopodioides* early in March, and at the end of April, when this plant had begun to die, migrated in large numbers to cotton; from cotton most of them migrated to *Croton* in the first part of July, where they continued to breed for the rest of the season; they also breed on *Croton* throughout the season. In 1924 cotton planted between 1st and 15th May was damaged more by *P. seriatus* than that planted before or after; it may be concluded that early planting is preferable to late, as in a more normal season cotton planted after 15th May would probably be severely damaged by the boll weevil [*Anthonomus grandis*, Boh.]. It was proved experimentally that *P. seriatus* was responsible for the blasting of small squares, and it was observed that the feeding of the Capsids on the stems of cotton, *M. clinopodioides* and *Croton* produced lesions that differed from those produced by a sterilised needle; similar lesions to those caused by feeding were, in some cases, produced by injecting fluid made from the crushed bodies of *P. seriatus* into plants. No connection has been discovered between the disorder of cotton attributed to the attack of the Capsid and soil, variety, or cultural or climatic conditions, and examinations of the insects and of *Croton* and abnormal cotton plants for a possible causal organism were all negative. There is considerable evidence to suggest that it is caused by a virus transmitted by *P. seriatus*, but no direct proof of this has been obtained. Sulphur dust was the most satisfactory insecticide tested, and did not injure cotton plants even when applied in very large quantities ; its effectiveness was greatly reduced by diluting it with flour or kieselguhr. Dusting with nicotine sulphate, free nicotine, or calcium arsenate had some effect but spraying with Bordeaux mixture or potassium sulphide had little or none.

HUCKETT (H. C.). **Control of Insects in the Cauliflower Seedbed on Long Island.**—*New York State Agric. Expt. Sta.*, Circ. 80, 11 pp. 4 pls., 2 figs. Geneva, N.Y., 1925. [Recd. October 1926.]

Insects injuring cauliflower seedlings in New York State include the cabbage root maggot [*Phorbia brassicae*, Bch.], most of the eggs of which are laid within ¼ in. of the surface of the soil and within 1 in. radius of the plant ; egg-laying continues for about a month. For the flea-beetles, *Phyllotreta* spp. and *Epitrix cucumeris*, Harr., the seedbeds should be inspected regularly during the first two weeks that the plants are above ground. If remedies are necessary, hydrated lime or a mixture of 10 lb. hydrated lime and 1 lb. calcium arsenate shaken over the plants from a cheesecloth bag in one or two applications will considerably reduce the numbers. Aphids, especially the spinach aphis [*Myzus persicae*, Sulz.], are the most important pests of seedling cauliflowers, and the remedies used against them are discussed [*R.A.E.* A, xiii, 246]. Thrips are also very injurious, and should be particularly watched for during a period of hot dry weather in May and June. The lower surface of the older leaves along the rows, especially the outside rows, should be examined for injury. The best remedies are the nicotine sulphate spray or dust and tobacco dust as recommended for the Aphids. The diamond-back moth [*Plutella maculipennis*, Curt.], although of less frequent occurrence, is capable of seriously injuring young foliage in a very short time. The moths fly in late June or early July, and the larvae when disturbed drop from the leaves on silken threads. As soon as they appear, the plants should be dusted with an arsenical or nicotine mixture ; the normal applications for thrips and Aphids are generally sufficient to keep this pest in check. A general dust recommended for all three pests is 1 lb. calcium arsenate to 5 lb. 2 per cent. nicotine sulphate dust, or 3 lb. calcium arsenate powder to 50 U.S. gals. nicotine spray mixture ; two applications at an interval of a week should be sufficient provided that heavy rain does not occur. The cabbage looper [*Phytometra brassicae*, Riley] is not generally a serious pest of cauliflower until late in the season, but the caterpillars may quickly strip the foliage. Both this moth and the white cabbage butterfly [*Pieris rapae*, L.] may be controlled by the methods used against *Plutella maculipennis*.

PARROTT (P. J.), GLASGOW (H.) & STEWART (F. C.). **Spraying and Dusting Experiments with Apples in 1924 and 1925.**—*New York State Agric. Expt. Sta.*, Circs. 78 & 84, 16 pp. & 11 pp. Geneva, N.Y., 1925 & 1926. [Recd. October 1926.]

Tables are given showing the comparative effect of numerous sprays and dust mixtures against the rosy aphis [*Anuraphis roseus*, Baker], the codling moth [*Cydia pomonella*, L.], red bug [*Heterocordylus malinus*, Reut.] and the fruit-tree leaf-roller [*Tortrix argyrospila*

Walk.], in various places in New York, as judged by the percentage of apples injured on the trees.

Owing to variations in the numbers of applications of different sprays and in their effects on the different pests, the details of these tables are not suitable for abstract.

FELT (E. P.). [**Reports of the State Entomologist, 1924 and 1925.**]—*New York State Mus. Bull.*, no. 260, pp. 46–54 & no. 267, pp. 37–48. Albany, N.Y., June 1925 & April 1926. [Recd. October 1926.]

In the summer of 1925 there was an unusually severe outbreak of *Pulvinaria amygdali*, Ckll., in peach orchards in New York State. The large amount of honey-dew secreted and the consequent deposition of sooty fungus rendered a large part of the crop valueless. It is possible that the infestation may be much reduced by spraying with lime-sulphur at winter strength in autumn or spring and supplementing this by spraying when the young are crawling with lime-sulphur, 1 : 40, with 10 lb. air-slaked lime to each 100 U.S. gals. Parasites have appeared in some of the orchards.

The western area infested by *Pyrausta nubilalis*, Hb. (European corn borer) increased somewhat during 1925, and this moth was more abundant in some sections of the State than formerly. Apple foliage was greatly damaged by caterpillars of *Malacosoma americana*, F. (apple tent caterpillar), and of *Alsophila pometaria*, Harr. (fall canker worm). Following the appearance in 1924 of unusual numbers of adults of *Erannis tiliaria*, Harr., the larvae were very injurious in 1925 to soft maples in swamps and to oaks and other trees at higher elevations. *Galerucella luteola*, Müll. (elm leaf beetle) continues to infest shade trees, particularly those near winter shelter. *Hemerophila pariana*, Clerck (apple and thorn skeletoniser), which since its introduction has spread in alarming numbers, seems to have passed its maximum and is probably now being largely controlled by its natural enemies.

The barrier zone against *Porthetria dispar*, L. (gipsy moth) is proving effectual in preventing the further westward spread of this pest. Sporadic outbreaks of *Bucculatrix canadensisella*, Chamb., occurred on grey birch. Observations on *Fenusa pumila*, Klug (birch leaf-miner), which is apparently a recent introduction, indicate the occurrence of only two generations in 1925 ; this sawfly has spread rapidly and is apparently extending its range. Other forest leaf-feeders included *Symmerista albifrons*, Abb. & Sm. (red-humped oak caterpillar) and *Epinotia aceriella*, Clem. (maple trumpet skeletoniser), on sugar maples [*Acer saccharum*], and leaf-mining caterpillars, such as *E. nanana*, Treit., *Olethreutes abietana*, Fern., and *Recurvaria piceaella*, Kearf., on spruces. The cocoons of *Argyresthia freyella*, Wlsm., were numerous on leaflets of *Juniperus virginiana*.

Other pests recorded were *Eumerus strigatus*, Fall. (lunate onion fly) in *Iris* bulbs ; *Pissodes strobi*, Peck (white pine weevil) ; *Hamamelistes spinosus*, Shimer (spiny witch-hazel gall Aphid), on birch, to which it migrates from witch-hazel [*Hamamelis virginiana*] ; *Psylla* (*Psyllia*) *striata*, Patch (birch Psyllid) ; *Phytomyza ilicis*, Curt. (American holly leaf-miner) ; and *Corythuca ulmi*, Osborn & Drake (elm lace-bug).

Back (E. A.) & Cotton (R. T.). U.S. Bur. Ent. **Biology of th** **Saw-toothed Grain Beetle,** *Oryzaephilus surinamensis* **Linné.** -*J.* *Agric. Res.*, xxxiii, no. 5, pp. 435-452, 4 figs., 5 tables, 36 ref Washington, D.C., 1st September 1926.

Silvanus (*Oryzaephilus*) *surinamensis*, L., which is of almos cosmopolitan distribution, was originally described from Dutch Guiana A description of all stages is given with a list of the synonyms.

The beetles feed, both in the adult and larval stages, on almost an stored products of vegetable origin, such as flour, stock and poultr feeds, copra, etc.; dried fruits are particularly liable to infestatio and stored grain is often badly damaged, though in this case th insect appears to be a secondary pest only, adults confined with soun wheat invariably dying of starvation. The size and somewhat fla form of the beetle enable it to enter apparently tightly wrappe packages; while, owing to its migratory habits and rapid multiplicatio it has been known to spread over whole stores and invade neighbourin houses.

The following observations were made in the vicinity of Washingto D.C. *S. surinamensis* hibernates in the adult stage, and seldom bree during the winter, though it remains active; in tropical countri breeding undoubtedly continues throughout the year. The adul which rarely if ever flies, is rather long-lived; several males lived f over 2 years, and while the majority of females seemed to live fro 6–10 months, a few lived over a year and one lived for 2 years an 8 months. The eggs are laid singly or in small clusters, either in som crevice in the food supply or loosely in finely-ground food such as flou Beetles emerging in the autumn do not usually lay their eggs unt the following April; in spring oviposition begins in 10 14 days aft emergence, and in hot midsummer weather the period may be as sho as 5–7 days. Eggs, varying in number from 45–285, are laid over period of 2–5 months. In summer, with mean average temperatur of 85–80° F. the incubation period is 3–5 days, while in spring an autumn with temperatures of 73–68° F. it varies from 8 to 17 days.

The larvae live on the same foodstuffs as the adults and do not confi themselves to one spot. The duration of the larval stage in spri is 4–7 weeks, at midsummer about 2, in autumn longer again, and winter in a laboratory heated only during the day about 8–10 week When full-fed, the larva attaches itself at its anal end to some sol object, and after a short almost quiescent period of about 1–7 day pupates and remains attached by its caudal end to the larval skin, f a period of 6-21 days. The period from egg to adult varied from (under favourable conditions) to 108 days (at a mean average te perature of 69° F.), there being normally 4–5 generations a year.

The Bethylid, *Neoscleroderma tarsalis*, Ashm., appears to be the on parasite of *S. surinamensis*, and it is doubtful whether it is of a practical value, though it probably acts as a natural control when i host is infesting grain and stock feeds stored for unusually long perio

The beetles are not very resistant to starvation; those kept witho food in midsummer died in 5 days. In the adult stage they are rath resistant to fumigants, but can be killed with hydrocyanic-acid g carbon bisulphide, ethyl acetate-carbon tetrachloride mixture or a other effective fumigant. Although low temperature of from 0–5° for one day kills all stages, adults and larvae withstood for three week temperature ranging from 30° to 35°. An exposure of one hour to 12 kills all stages, and a vacuum of 29 inches for 7 hours kills the adul

KIRBY (H.). **On *Staurojoenina assimilis* sp. nov., an intestinal Flagellate from the Termite, *Kalotermes minor* Hagen.**—*Univ. California Pubns. Zool.*, xxix, no. 3, pp. 25–102, 7 pls., 7 figs., 118 refs.

The Intestinal Flagellates of the Termite, *Cryptotermes hermsi*, Kirby.—*Ibid.*, no. 4, pp. 103–120, 2 pls., 4 figs., 10 refs.

LIGHT (S. F.). **On *Hoplonympha natator* gen. nov., sp. nov. A Non-Xylophagous Hypermastigote, from the Termite, *Kalotermes simplicicornis* Banks, characterized by biradial Symmetry and a highly-developed Pellicle.**—*Ibid.*, no. 5, pp. 123–140, 28 figs., 6 refs.

On *Metadevescovina debilis* gen. nov., sp. nov. A Xylophagous Polymastigote from the Termite, *Kalotermes hubbardi* Banks.—*Ibid.*, no. 6, pp. 141–157, 1 pl., 3 figs., 7 refs. Berkeley, Cal., 1926.

The material on which these studies is based was obtained in Arizona and California in the case of *Calotermes* (*Kalotermes*) spp.; and at Fanning Island, Central Pacific, in that of *Cryptotermes hermsi*. The first paper includes two lists of the protozoa living in termites, the first arranged according to their systematic position and the second according to their hosts.

HOUGH (W. S.), STEARNS (L. A.), WILLEY (C. R.) & CAGLE (L. R.). **Codling Moth Investigations in Virginia.**—*Virginia Polytech. Inst. Agric. Expt. Sta.*, Bull. 248, 27 pp., 8 figs. Blacksburg, Va., April 1926. [Recd. October 1926.]

A conservative estimate of the average annual loss due to codling moth [*Cydia pomonella*, L.] in Virginia is about 5 per cent. of the apple crop, but in 1925 this was more than doubled.

In orchards harbouring a large number of overwintering larvae 4 sprays are recommended, the first to be applied when most of the petals have fallen, the second, third and fourth 3, 5, and 10–11 weeks later respectively. The correct timing of the spray is essential, the first being indicated by the fall of the blossoms and the later ones by egg-laying and hatching. Satisfactory results have been obtained during the past four years in many orchards by using 3 lb. lead arsenate to 100 U.S. gals., without any spreader. With three thorough applications, the first spray as above and the next two 4 and 10 weeks later, the infestation has been kept down to a maximum of 2 per cent. or less of the crop.

WEISS (H. B.). **Results of the Sixth Year's Work against the Gipsy Moth in New Jersey.**—*New Jersey Dept. Agric.*, Circ. 105, 32 pp., 27 figs., 1 map. Trenton, N.J., August 1926.

This report on the control of the gipsy moth [*Porthetria dispar*, L.] records the work accomplished during 1925–26.

COBB (N. A.). **The Species of *Mermis*. A Group of very remarkable Nemas infesting Insects.**—*Jl. Parasitology*, xii, no. 1, pp. 66–72, 1 pl., 1 fig., 5 refs. Urbana, Ill., September 1926.

Mermis subnigrescens, sp. n., previously recorded as *M. nigrescens* or a closely allied species [*R.A.E.*, A, xiii, 564], is common in the body-cavity of the grasshoppers, *Melanoplus femur-rubrum*, DeG., *Chorthippus* (*Stenobothrus*) *curtipennis*, Harris, *Chortophaga viridifasciata*, DeG., *Orphulella pelidne*, Burm., and *Encoptolophus sordidus*, Burm., in Massachusetts. It probably also occurs in the other northern United States and in southern Canada, more or less co-extensively with the hosts.

In late summer or early autumn it enters the soil, leaving the host dead on the ground. The eggs are laid the following season or probably more often the second following season. Oviposition may possibly continue through two seasons; the eggs are deposited above ground on parts of the plants exposed to light, where they are likely to be eaten by the grasshoppers, and under favourable conditions the females can make their way back into moist soil.

Huckett (H. C.). **Further Studies concerning the Aphiscidal Properties of Tobacco Dust.**—*N. Y. State Agric. Expt. Sta.*, Tech. Bull. 121, 29 pp., 4 charts, 26 refs. Geneva, N.Y., August 1926.

The results of some of these experiments in using tobacco dust mixtures against Aphids on cabbages and cauliflowers in New York have already been noticed [*R.A.E.*, A, xiii, 246].

The following is the author's abstract of his conclusions of the work as a whole:—

Under laboratory conditions, it was found that, all factors being equal, the toxicity of tobacco dusts of fine quality varied in degree according to the percentage of nicotine content. The higher the percentage of nicotine the greater the toxicity shown within limited periods of time throughout an experimental period of one to seven days. Pure tobacco dust, or tobacco-hydrated-lime dust mixtures, the tobacco of which contained approximately 1 per cent. nicotine, under favourable conditions, varied in degree of toxicity according to length of Aphid exposure. Short exposures (30 minutes) exerted but little influence in obtaining efficient results, while long exposures (3 hours) were attended with marked increase in the killing efficiency of such dusts. The addition of hydrated lime to tobacco dusts of low or high nicotine content in a 50 to 50 proportion improved the physical properties of the dusts and rendered them more actively toxic. The toxicity of dusts of low nicotine content showed comparatively greater improvement by such additions than dusts of high nicotine content. The dilution of tobacco dusts of low nicotine content with hydrated lime in amounts greater than equal parts of each by weight was detrimental to the insecticidal efficiency of the mixture. The addition of water to pure tobacco dusts in quantities varying from 5 to 20 per cent. had very little effect, if any, in improving the toxic properties of the dusts. The addition of water to dust mixtures of tobacco and hydrated lime had in all cases a marked effect in heightening the toxic value of such mixtures in the dry form, whether determined immediately following such addition or after a period of four to seven days' exposure. The initial amount of water, whether 5, 10, 15, or 20 per cent., appeared to make relatively little difference in the degree of toxicity shown by all samples of tobacco dust used. All cases were equally effective. Under field conditions, tests were carried on with tobacco dust of approximately 1 per cent. nicotine content upon Aphids infesting cauliflower seedlings in the seedbed. Tobacco dust treatment gave superior results over other forms of nicotine treatment, due, it was thought, to the slower liberation of nicotine fumes in lethal quantities over an extended period of time, thus protecting the plants from daily reinfestation ; and, also, due to its fertilizer effect on plant growth. Tobacco dust diluted with hydrated lime in proportions equivalent to equal parts by weight affected the growth of the plants as favourably, and controlled the Aphids as effectively, as pure tobacco dust.

MOULTON (D.). **New California Thysanoptera with Notes on other Species.**—*Pan-Pacific Ent.*, iii, no. 1, pp. 19–28, 15 figs. San Francisco, Cal., July 1926.

The species dealt with include *Chirothrips similis*, Bagnall, which is common in California on grasses, wild lupin, *Monardella villosa* and the terminal leaf clusters of plum trees, previously only recorded from England ; and *Drepanothrips reuteri*, Uzel, causing considerable damage to vines in California, previously only recorded from Europe.

McGREGOR (E. A.). U.S. Bur. Ent. **A Device for Determining the Relative Degree of Insect Occurrence.**—*Pan-Pacific Ent.*, iii, no. 1, pp. 29–33, 1 fig. San Francisco, Cal., July 1926.

The apparatus described was evolved by the author during work on the citrus thrips [*Scirtothrips citri*, Moult.], and may be used as a means of measuring the degree of infestation by any similar insect. It consists of a box, at the bottom of which is placed a sheet of paper painted over with a thin layer of adhesive (leaving a half inch margin). A cigar box is convenient for the purpose. The sheet of paper should fit the box, as should also a frame of wood or corrugated cardboard, which is placed on top of the paper. The opening in the frame corresponds to the area covered by tanglefoot. Over this frame a piece of screen is fitted, the mesh of which must be large enough to allow the insect to be studied to fall through it, but not larger ones. For use the box is placed under the branches in different parts of the orchard and the thrips shaken into it, so that the average number to a branch may be calculated.

ESSIG (E. O.). **The Madrona Aphis.**—*Pan-Pacific Ent.*, iii, no. 1, pp. 42–43, 1 fig. San Francisco, Cal., July 1926.

Anuraphis madronae, sp. n., was taken from the bark of *Arbutus menziesii* in California. It occurs in dense colonies on the trunks and larger limbs from the surface of the ground to a height of 6–8 feet. Large numbers of ants are always present on the infested trees.

FLANDERS (S. E.). **Insect Enemies of the Codling Moth in the Vicinity of Ventura, California.**—*Pan-Pacific Ent.*, iii, no. 1, pp. 44–45. San Francisco, Cal., July 1926.

The following parasites and predators have been observed during four years' observations on the codling moth [*Cydia pomonella*, L.] : the Ichneumonids, *Aenoplex carpocapsae*, Cush., the life-cycle of which averages 46 days under insectary conditions, *A. plesiotypus*, Cush., an undescribed species of *Aenoplex*, *Ephialtes sanguineipes*, Cr., and an undescribed species of *Exetastes* ; the Chalcids, *Trichogramma* sp., and *Prospaltella* sp. ; an undescribed Tachinid of the genus *Lixophaga* ;

and the Clerids, *Cymatodera angustata*, Spin., attacking the pupae under the bands, *C. ovipennis*, Lec., and *Hydnocera scabra*, Lec., which is the most effective predator of the hibernating larvae.

The more important parasites are the species of *Aenoplex* and *Trichogramma*. The former are themselves commonly parasitised by *Dibrachys boucheanus*, Ratz.

Palmer (M. A.). **Life History Studies of Seven Described Species of the Genus** *Lachnus*.—*Ann. Ent. Soc. Amer.*, xix, no. 3, pp. 300–324, 6 pls. Columbus, Ohio, September 1926.

The species dealt with, all of which occur in Colorado, have not been previously fully described or illustrated. Much work has been done by the author in rearing the different forms in the insectary, and practically in every case they have been checked by comparison with specimens taken in nature. Sexual forms of all except *Lachnus pseudotsugae*, Wilson, have been reared ; the various forms and stages are described.

The eggs of *L. pseudotsugae* are laid on the needles of *Pseudotsuga taxifolia*. This Aphid feeds on the bark of the twigs, is moderately active and has a periodic instinct to wander. Whole colonies will suddenly leave the twig just before they are ready to reproduce. No heavy infestations by this species have been noticed. The place of oviposition and feeding habits of *L. taxifoliae*, Swain, are very similar, the colonies frequently moving to other parts of the tree.

L. occidentalis, Davidson, occurs on *Abies lasiocarpa* ; oviposition differs from that of most other species of *Lachnus* in that eggs are laid singly on the ventral side of the needle, rarely more than one on a needle, instead of 5–8 in a row on the dorsal side. It is quite a common species and is found in large colonies ; though it feeds on the bark of the twigs, it has the peculiar habit of migrating to the needles when ready to moult.

L. oregonensis, Wilson, the eggs of which are found on young cones of *Pinus murrayana*, mostly on the underside and at the bases of scales, is comparatively rare, but it occurs in large colonies, its presence being usually betrayed by attendant ants.

L. edulis, Wilson, is the most common and generally distributed Aphid on *Pinus edulis* and occurred in injurious numbers in California in 1922. The eggs are laid on the upper side of the needles. Those of *L. vandykei*, Wilson, are found at the base of the needles of *Picea engelmanni* ; this species occurs in small colonies but is not common. *L. schwarzi*, Wilson, is very common and is found in quite large colonies, the eggs being laid on the needles of *Pinus scopulorum*.

Griswold (G. H.). **Notes on some Feeding Habits of two Chalcid Parasites.**—*Ann. Ent. Soc. Amer.*, xix, no. 3, pp. 331–334, 1 fig., 14 refs. Columbus, Ohio, September 1926.

The literature concerning observations on Chalcids feeding on their hosts at the point where the ovipositor has been inserted is briefly reviewed. The observations described deal with *Aphidencyrtus inquisitor*, How., and *Aphelinus jucundus*, Gah., reared from *Macrosiphum cornelli*, sp. n. (a description of which by E. M. Patch is published at the end of the paper). This Aphid occurred on geraniums in the greenhouse in the autumn.

Aphidencyrtus inquisitor could be found at almost any time of the day standing on the back of an Aphid and either inserting its ovipositor or feeding at the droplet of liquid that came from the hole thus made. The Aphid was apparently not disturbed by either action and was often seen walking about for some minutes with a parasite on its back.

The method of attack of *Aphelinus jucundus* is somewhat different, it approaches its victim stealthily and suddenly thrusts the ovipositor outward and upward into the Aphid. Almost any part of the body may be attacked. The Aphids are always rendered helpless and were not noticed to revive.

Laboratory experiments intended to show how long a parasite can be kept alive on the liquid from their hosts are described. The life of *A. jucundus* could not be greatly prolonged in this manner, but that of *Aphidencyrtus inquisitor* was considerably lengthened, averaging over 27 days as compared with 3·5 days in unfed individuals.

Zoology and Entomology. *39th Ann. Rept. Pennsylvania Agric. Expt. Sta., 1925–26*, Bull. 204, pp. 35–38, 1 fig. State College, Pa., July 1926.

The principal results obtained in the investigation on the oriental peach moth [*Cydia molesta*, Busck] have been noticed elsewhere [*R.A.E.*, A, xiv, 447]; in 1926 the moths from hibernating larvae began to emerge on 5th May, as compared with 18th April in 1925; for trapping the adults a bait consisting of 1 part molasses and 10 parts water gave the most satisfactory results under orchard conditions. In treating the soil in lettuce cold-frames in late autumn for the control of millepedes [*R.A.E.*, A, xiii, 635], granular calcium cyanide applied at the rate of 400 lb. to the acre, either drilled in with a seed drill or scattered broadcast and raked in, was effective.

An investigation of the bionomics and control of insects and mites injurious to cultivated mushrooms was begun; mites [? *Tyroglyphus lintneri*, Osb.] were controlled by the application of a proprietary sheep dip, but this treatment killed the mushrooms and retarded the growth of the spawn, and so could only be used on beds where the infestation is serious, to prevent it from spreading. Flies [? *Sciara* sp.] were attracted to pans filled with kerosene placed under electric lights in the mushroom houses, and a large proportion was killed in this way; dusting with about 2 lb. pyrethrum powder to each 60 foot house also controlled them. The most satisfactory control of all pests in mushroom houses is obtained by fumigation when the manure is at its highest temperature (130–140° F.), the best fumigant tested being calcium cyanide; if mushrooms are being grown in the houses adjacent to the one that is being fumigated, care must be taken that the former are well ventilated, as otherwise the hydrocyanic acid gas penetrating the walls may injure the growing mushrooms in them.

As the result of experiments on the control of wireworms with granular calcium cyanide [*R.A.E.*, A, xiv, 268], it is recommended that maize should be sown in rows 2 feet apart in the early spring as a trap crop, when the wireworms are beginning to move towards the surface of the soil, and that about two weeks later, when most of them are feeding on the maize, calcium cyanide, at the rate of 150 lb. to the acre, should be drilled in close to the rows of maize and at least as deep as the seeds were sown; this method gave slightly better results than broadcasting calcium cyanide, at the rate of 250 lb. to the acre, in the late spring, when the wireworms were in the top 4–5 inches of soil, and ploughing i in at once.

Gardner (L. R.). **Notes on the Control of Mealybugs.**—*Jl. Ent. & Zool.*, xviii, no. 3, pp. 57–58. Claremont, Cal., September 1926.

The three usual methods of eradicating mealybugs [*Pseudococcus* etc.] from the soil of potted and boxed plants in nurseries and greenhouses are the removal of soil from the roots, soil fumigation, and drenching the roots and soil with a contact spray. These may be used in combination or singly. The soil that has been removed should be burnt or otherwise disposed of, and the plants, before being repotted in clean soil, should be hand-picked and dipped in a 1 to 600 solution of 40 per cent. nicotine sulphate. The same solution may be used for drenching the soil without removing the plants, or carbon bisulphide may be used at the rate of a teaspoon to a tablespoon to plants in 4–8 inch pots and for those in larger containers at the rate of 1 fluid dram to 4 cu. ft. of space. With the last two methods, treatment should be made at intervals of 1–2 weeks and continued until eradication is complete. All these remedies should be preceded by the eradication of the mealybugs on the parts of the plants above ground, and this should include the control of ants. The two methods in general use are fumigation with liquid hydrocyanic acid gas at the rate of 14–18 cc. to each 100 cu. ft. of air space under glass and spraying. The best contact spray is probably the one already mentioned, in which case it is as well to dilute the nicotine sulphate in warm soapy water. Plants other than those in greenhouses may be treated with a similar spray or a good contact oil spray, or fumigated with hydrocyanic acid gas under tents, using a dosage of 18–24 cc. to each 100 cu. ft. of air space. In all cases the treatments should be repeated at intervals of 1–2 weeks.

Worthley (L. H.) & Caffrey (D. J.). **Timely Information about the European Corn Borer.**—*U.S. Dept. Agric.*, Misc. Circ. 70, 8 pp. 4 figs. Washington, D.C., June 1926.

In order to prevent the further spread of the European corn borer [*Pyrausta nubilalis*, Hb.] into the United States near Lake Erie it is essential to carry out strictly the quarantine regulations and the usual recommendations for cutting and clearing up the maize crop. The practical application of these methods is discussed.

Lacroix (D. S.). **Miscellaneous Observations on a Cranberry Scale *Targionia dearnessi* (Ckll.) (Homop.: Coccidae).**—*Ent. News* xxxvii, no. 8, pp. 249–251, 1 ref. Philadelphia, Pa., October 1926.

The Coccid, *Targionia dearnessi*, Ckll., which occurs throughout the United States, is found in Massachusetts on cranberry (in bogs subjected to regular floodings as well as in dry bogs) and bearberry (*Arctostaphylos uva-ursi*) round the edges of the bogs, but appears to cause no injury of any importance, though in about six weeks the stem becomes somewhat swollen where the female has been feeding. Unlike most Coccids the females generally occur singly, though as many as ten males may be found together. The young move away and generally settle on new growth, where the females remain for the rest of their lives.

The adults of both sexes are described, and brief notes on the life-history are given. Other food-plants are *Kuhnistera pinnata* and several unidentified weeds. The scale is parasitised to a considerable extent, and two Chalcids, *Coccidencyrtus ensifer*, How., and a species of *Signiphora* that is probably new, have been bred from it.

WELLS (A. B.). **Notes on Tree and Shrub Insects in Southeastern Pennsylvania.**—*Ent. News*, xxxvii, no. 8, pp. 254–258. Philadelphia, Pa., October 1926.

Observations are recorded, mostly in 1925, on a large number of tree and shrub insects, including the Pyralid, *Moodna ostrinella*, Clem., the larvae of which were found in August infesting dried-up unopened peony buds. The moths began to emerge on 5th September, though some of the caterpillars had not pupated by January. The sawfly, *Acantholyda erythrocephala*, L., the adults of which were beaten from pine and *Cornus* in May, has not previously been recorded from the United States.

MAXSON (A. C.) & HOTTES (F. C.). *Georgiaphis* **nom. n. for** *Georgia* **(Aphididae, Homop.).**—*Ent. News*, xxxvii, no. 8, pp. 266–267. Philadelphia, Pa., October 1926.

As the Aphid genus *Georgia*, Wilson, is preoccupied in Reptilia the name *Georgiaphis* is suggested for it. The authors do not agree with Mordvilko in treating *Georgia* as a synonym of *Colopha*.

CHAMBERLIN (W. J.). **The Buprestidae of North America exclusive of Mexico.**—8vo, 289 pp., 45 pp. refs. Corvallis, Oregon, The Author, 1926.

In this catalogue, details of the distribution and food-plants of the various species are given.

DAVIS (J. J.). **Opportunities in Entomology.**—*Proc. Indiana Acad. Sci.*, xxxiv (1925), pp. 2, 299–302. Indianapolis, Ind., 1926.

The various branches of entomology as a profession are briefly reviewed, and the requirements for students taking up such work are discussed.

EDWARDS (C. W.). **Report of the Guam Agricultural Experiment Station, 1924.**—14 pp., 7 figs. Washington, D.C., April 1926.

During the latter part of December 1923 *Aspidiotus destructor* (coconut scale) was found to be widely distributed over the northern half of the island of Guam, where it caused considerable damage in certain restricted areas. In these the infested leaves and undergrowth were cut and burnt as an emergency method of control. The beetle, *Cryptogonus orbiculus* var. *nigripennis*, was the only natural enemy observed. The crop of taro (*Colocasia esculenta*) was practically ruined by a leafhopper, *Megamelus* sp., and by *Prodenia litura* (cotton worm).

WHEELER (W. M.). **Les sociétés d'Insectes. Leur origine—leu évolution.**—16mo, xii+468 pp., 61 figs., 45 pp. refs. Pari Gaston Doin, 1926. Price *Fr.* 25.20.

In this series of popular lectures on the various groups and famili of insects characterised by their formation into social communitie the author deals with the general characters of insect societies, explai their evolution and discusses such phenomena as polymorphis and the evolution of associates and parasites connected with them.

NOZU (R.) & SONOYAMA (I.). **Results of Studies on** *Phaedon incertu* **Baly (Chrysomelidae).** [*In Japanese.*]—*Agric. Expt. Sta. Shima Prefecture*, pp. 1–162, 4 pls. Shimane, Japan, March 1926.

The Chrysomelid, *Phaedon incertum*, Baly, is widely distributed ov Japan, where it feeds on cruciferous vegetables in the adult and larv stages, causing serious damage. There are 2 or 3 generations a ye in the field, but 5 occurred experimentally. The adults begin t hibernate in December in sheltered places and usually remain dorma until the end of August of the next year. Mating takes place 7 day after they begin to feed, and eggs are laid singly on the leaves of th food-plants. Each egg is laid in a wound made by the mandibles the adult on the plants. They hatch in 5–24 days, with an averag of 14½, and the larvae mature in 8–24 days, with an average of 16 Pupation occurs in the soil, the pupal stage lasting 5–17 days, wit an average of 11. The adults live 211–950 days, with an average 580 in the field, and 505 experimentally, and during this period an average 1,244 eggs are laid by a single female. The remedi measures recommended are collecting the adults and spraying wit derris mixtures.

KONO (H.). **Life-histories of** *Apoderus fulvus* **Roel., and** *Euops ac* **n. sp. (Curculionidae).** [*In Japanese.*]—Dobuts. Zasshi [*Zo Mag.*], xxxviii, no. 454, pp. 217–224. Tokyo, August 1926.

Apoderus fulvus, Roelofs, has two generations a year near Sappor the adults appearing in May and June and again in July and Augus The females roll the leaves of *Magnolia kobus* for oviposition. *Euo aceri*, sp. n., of which a description is given in German, rolls the leav of *Acer* spp. for this purpose. The method of rolling the leaves described in detail.

GOODWIN (W.), MASSEE (A. M.) & LEPELLEY (R. H.). **Tar-distilla Washes. Their comparative Effectiveness, under different Co ditions, on various Pests, and at increasing Concentrations.**—*J Pomology & Hortic. Sci.*, v, no. 4, pp. 275–286, 1 graph, 1 re London, October 1926.

Parallel tests were made with two proprietary tar-distillate wash and two tar-distillate preparations of known origin, with the obje of obtaining, if possible, a wash made from well-known and easi procurable raw material that would give as satisfactory results as t best proprietary preparations. The tar from which distillates a obtained varies according to the coal and the method of preparati and the process of distillation also varies; consequently the chemi composition of tar-distillates, even from the same source, is not consta and it is impossible to lay down a strictly defined standard. It clear, therefore, that a proprietary wash may vary considerably from time to time. Certain fractions produced in the distillation process are, however, known by definite names, such as "light oil," "creosote oil" and "anthracene oil," and have fairly well defined boiling points, so that it is possible to suggest a formula upon which a wash may be prepared and to check its composition subsequently by chemical analysis.

From an examination of a number of tar-distillate washes it was concluded that, although some contained materials other than those derived from coal-tar, their efficiency depended only on the tar oils that they contained. Two standardised tar-distillates were obtained for the experiments; the first was made from 75 per cent. commercial "light oil" containing 20 per cent. phenols, of specific gravity 1·016, having the following range of boiling points: 13 per cent. at 200° C. [392° F.], 51 per cent. at 220° C. [428° F.], 78 per cent. at 250° C. [482° F.], and 90 per cent. at 300° C. [572° F.]; the second was made similarly, but from "anthracene" or "green" oil, of specific gravity 1·1, having the following range of boiling points: 10 per cent. at 220° C., 20 per cent. at 260° C. [500° F.], 40 per cent. at 300° C., and 60 per cent. at 380° C. [716° F.]. Emulsions were made by means of resin and castor-oil soap. Both the standardised washes and the two proprietary ones tested mixed well with tap water, without any separation of large globules of tar oil, indicating that efficient emulsification apparently presents no special difficulties. The diluted sprays from all four preparations spread satisfactorily over stems and branches, and no injury to trees was noticed, although weeds under them were severely injured.

In field tests with the two standardised washes and one of the proprietary washes at 7½ per cent., applied in January, only from 35 to 47 per cent. of the viable eggs of *Phorodon humuli*, Schr. (hop-damson aphis) were killed, but in laboratory tests with the same washes and another proprietary one the percentage of viable eggs of *P. humuli* killed ranged from 56 to 77; the "light oil" standardised wash was in each case the least effective. The percentage of viable eggs on the control shoots was 75 per cent. in the laboratory, but only 55 in the field, a fact that indicates the need for care in comparing field and laboratory results. The method used in these tests for measuring the toxicity of the sprays to insect eggs [*R.A.E.*, A, xiv, 514–515] is believed to be fairly accurate. The "light oil" standardised wash at 7½ per cent., applied early in January, killed 84 per cent. of the viable eggs of *Cheimatobia brumata*, L. (winter moth) on apple trees; in this case the eggs were scarce and each was labelled. Eggs of *Notolophus* (*Orgyia*) *antiquus*, L. (vapourer moth) were used in laboratory tests to determine the efficacy of different strengths of the "anthracene oil" standardised wash. At 5 per cent. this wash killed 95 per cent. of the viable eggs, but with this exception the percentage of viable eggs killed rose from 26, at 3 per cent., to 99, at 20 per cent., and it is thought that the very high figure for the 5 per cent. spray may be due to an error that has not yet been traced. At 7½ and 10 per cent., the strengths usually recommended, the sprays killed 79 and 86 per cent. of the eggs, respectively, and the optimum strength for orchard use probably lies between 5 and 10 per cent. In making these calculations larvae that died before they had emerged completely were not included in the number of eggs hatched. Some of the eggs of *N. antiquus* were parasitised by a Scelionid, *Telenomus dalmani*, Ratz.

Jary (S. G.). **Trials of Tar-Distillate Washes in the West Midlands.**
Jl. Minist. Agric., xxxiii, no. 8, pp. 753–761. London, Novemb
1926.

The results obtained by the use of tar-distillate washes in 1925 a
1926 are discussed [*R.A.E.*, A, xiv, 400, 567]. The eggs of Aphi
Psylla mali (apple-sucker), and, to some extent, those of *Cheimatob*
brumata (winter moth) and Tortricids are killed by two proprieta
washes at 4 and 8 per cent. strength, but a concentration of 10 p
cent. is considered the most effective and is also efficacious against eg
of the Capsid, *Plesiocoris rugicollis*. Apple buds sprayed with th
strength are uninjured provided they are dormant at the time
application. The washes should be made up with soft water if possib
particularly at the 10 per cent. strength. At 8 or 10 per cent., howev
the development of blossom buds of damsons and plums is retarded
suppressed, and therefore the washes should not be used at more th
6 per cent. strength on these trees, and should only be applied wh
the buds are dormant and never later than the end of January.

Chandler (S. C.), Flint (W. P.) & Huber (L. L.). **Recent Insectici**
Experiments in Illinois with Lubricating Oil Emulsions.—*Bu*
Illinois State Nat. Hist. Survey, xvi, art. 2, pp. 103–126, 2 fi
Urbana, Ill., May 1926.

The following is taken from the authors' summary of this paper :

This report gives the results of four years' experiments on the cont
of San José scale [*Aspidiotus perniciosus*, Comst.] at various points
southern Illinois. The superiority of oil sprays over lime-sulphur w
demonstrated, 11 per cent. of the scale remaining alive after being
with lime-sulphur, as compared with less than 2 per cent. with most
the oil sprays. Boiled emulsion was as effective as the various misci
oils used. Cold-mixed oil emulsions were about as effective as the boil
emulsions, but somewhat more unstable. The most reliable type
home-made emulsions are the boiled soap-emulsions. Vegetable-
soap was as as effective in making the boiled emulsions as fish-oil soa
Emulsions made from oils with viscosities below 80 have not sho
uniformly good kill of scale. There were apparently no differences
effectiveness on San José scale in emulsions made from oils of 90 to 2
viscosity.

Tests with boiled potash-fish-oil-soap emulsions in summer show
very little injury to apple foliage, but considerable injury to peach a
to a few other plants under some conditions. Owing to the difficul
in reaching the scales when the trees are in foliage, summer sprays a
not recommended except in case of very severe infestation. Where
emulsions were properly mixed and applied, no injury to trees resulte
On the basis of these experiments and observations, the following
commendations are made : Oil emulsion is recommended as a che
and effective spray for the control of San José scale. The formula
the stock emulsion found best in the experimental work is as follow
Oil 1 U.S. gal., potash-fish-oil-soap 1 to 2 lb., water ¼ U.S. gal. T
materials should be heated to boiling and pumped twice at a pressu
of 75 lb. or more. The strength recommended is 2·4 per cent. (3 ga
in 100), or, in case of severe and increasing infestation, 4 gals. in 1
gals. water. The best oil to use, judging by these experiments and the
of investigators in Indiana and Arkansas, is a lubricating oil comi

within the following limits: Specific gravity ·87 to ·93 at 20° C. [68° F.]. Volatility, not above 2 per cent. at 110° C. [230° F.] for 4 hours. Viscosity, 90 to 250 seconds (Saybolt test) at 100° F.

If cold-mixed emulsions are used, they may be made according to the following formulae: Bordeaux, cold-mixed: Pump together equal parts of oil and 4-4–50 Bordeaux mixture, sending the material at least three times through the pump. Calcium caseinate, cold-mixed: Pump together 2 U.S. gals. oil and 1 U.S. gal. water in which is dissolved 4 oz. calcium caseinate.

GRAY (G. P.) & DE ONG (E. R.). **California Petroleum Insecticides. Laboratory and Field Tests.**—*Indust. & Engin. Chem.*, xviii, no. 2, pp. 175–180. Easton, Pa., February 1926.

Petroleum oils and their derivatives are among the most important insecticides. Experience has shown, however, that, although many of the unrefined and consequently cheaper materials are considerably more toxic to insects than kerosene, they are also more toxic to vegetation. The general belief among entomologists has been that an oil with a high specific gravity and an abnormally low flash point is the most injurious to plants, but as these tests were considered to be insufficient, the authors have examined some 35 of these commercial oils, not only by the usual methods of density, flash point, distillation and viscosity, but also under the further tests of sulphonation, in which fuming sulphuric acid and heat were used to hasten the reaction, and by a capillary test, in which the capillarity or penetrating quality of the oils was measured on ordinary blackboard crayons. Toxicity tests in the laboratory showed that crude xylene, obtained from a crude petroleum naturally rich in aromatic oils, having about the same density as kerosene and containing 45 per cent. of oils soluble in sulphuric acid, caused acute injury whenever applied. Liquid petrolatum, a highly refined heavy oil, generally used medicinally, was shown to be the least injurious of all the oils tested. The low solubility of this oil in sulphuric acid (1 per cent.) is significant. Field experiments were made on *Citrus* trees; unfortunately the effect on the fruit could not be observed, as the trees had not come into bearing. Kerosene had very little effect on foliage, but upon contact with the roots produced severe injury. Petrol and crude xylene always caused severe scorching of both leaves and wood. The kerosene types of oil (39° to 42° Bé.), even when used at double the customary 10 per cent. strength, produced no bad effect, indicating a wide margin of safety for this group. With an increase of gravity to 34° Bé. the margin of safety was narrower. As the gravity increased, injury was nearly always more marked, even though the amount of oil was reduced to 1 or 2 per cent. Oils ranging from 25° to 35° Bé., when applied at excessive strengths, caused defoliation ranging from 1 to 100 per cent. Very heavy oils (15 to 22° Bé.) were slower in action than the lighter ones. Three distinct types of injury to foliage and branches was observed; killing of the leaf tissue within 48 hours of application, as with petrol and xylene; defoliation after 3 or 4 days without loss of colour in the leaves or stunting of the bearing wood; and a deposit of oil on the leaves, with yellowing of foliage and stunting of all sprayed parts, which appears 2 or 3 weeks after spraying and may be present for months. Injury from light oils was not permanent, unless from excessive dosage or when the roots are weak, but severe defoliation, caused by heavy oils, was accompanied l stunting of the bearing wood and sprouting in the centre of the tree, a the production of stunted leaves to replace those lost.

The general action of all of the oils tested is summarised in a table, t oils being listed in the order of their toxicity to plants. The resul indicate that the density and sulphonation tests of these oils are t most valuable. Other tests, such as viscosity and capillarity may al be of use, but require further investigation before their full importan can be determined. The significance of the density and sulphonati tests are discussed. The specific gravity of a petroleum distillate undoubtedly of service in determining the probable toxicity to plan provided that the distillate is direct from the still, without furth treatment. In conjunction, an abnormally low flash point may l taken to indicate the probable presence of aromatics or cracked oil Observations also indicate that, with very few exceptions, the co stituents that are capable of being removed from a petroleum distilla by refining with sulphuric acid are the most toxic to foliage. T sulphonation test therefore seems the most reliable measure of t toxicity of these oils and is proposed as a laboratory method for t examination of petroleum distillates for the estimation of their degr of refinement and their probable toxicity to foliage. All the oils clas fied in the table as very toxic to plants contain large percentages chemically active oils (sulphuric—acid soluble), some over 40 per cent these percentages decreasing in the less toxic oils in direct proporti to safety to the plant.

MORRILL (A. W.). **Airplane Dusting for the Control of Vegetab Pests on the Mexican West Coast.**—*Jl. Econ. Ent.*, xix, no. pp. 695–699. Geneva, N.Y., October 1926.

This paper, of which only the abstract is published, records t results of dusting by aeroplanes during the first four months of 192 in Mexico, when 7,500 acres of tomatos were treated. Calcium arsena was used against *Heliothis obsoleta*, F. (bollworm), and *Phthorima glochinella*, Zell. (tomato leaf-folder), and calcium cyanides again *Halticus citri*, Ashm. (garden flea-hopper). Wind was not found to inte fere much with the applications if made before 10 a.m. or after 5 p. From 4 to 12 lb. of calcium arsenate were used to the acre, accordi to the size of the plants, and in only one instance was any dama noticed on leaves and tender shoots, and never on the fruit. T amount of arsenate deposited on the leaves was found to decrea gradually between 30 and 90 feet from the line over which the aeropla passed. Taking 100 as the dosage in the central 60 foot swath whe the distribution was apparently quite uniform, the dosage at 90 fe amounted to 60. The overlapping of the dust clouds tended to corre this unevenness of distribution. These tests were thought to demo strate that the evenness of distribution and the penetration of the vin showed a decided advantage of this method as compared with groun machines.

Various calcium cyanide compounds were tested against *H. cit* The finer calcium cyanide dusts and dust mixtures that evolve t gas in a comparatively brief period proved to be ineffective for dusti in open fields. The insects under this treatment became stupifi for a few hours and then recovered, very few of either adults or nymp being killed. The granular and flake forms of calcium cyanide, affording a slow generation of the gas, gave entirely different results; the application of 40 to 60 lb. of calcium cyanide flakes to the acre by aeroplane frequently resulted in 100 per cent. mortality. The results were not, however, uniform, and while in many cases there was no injury to the plants, in others these were killed with approximately the same dosage. Granular and flake cyanides were applied from a height of 25 ft., that is, two or three times as high as in case of calcium arsenate, and the flakes were found to spread over an area of only 15 to 20 feet on each side of the plane. The cost of using an aeroplane was therefore proportionately much higher than when a powder was used. Later experiments indicate that the granular form may be found preferable for use against *H. citri*. The work is not yet considered conclusive.

LARSON (A. O.). U.S. Bur. Ent. **Observations on the Characteristic Injury caused by the Lima Bean Pod Borer,** *Etiella zinckenella*, **Treit., and other Insects with which its Injury is confused in California.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 699–703. Geneva, N.Y., October 1926.

Etiella zinckenella, Treit. (lima bean pod borer) is practically confined to lima beans (*Phaseolus lunatus*) and attacks all varieties grown in California. The eggs are laid on the outside of the growing pod or other part of the plant, and the larva upon hatching bores into the green pod, where it feeds on the growing beans. The point of entrance closes over, leaving only a black spot, and the larva attacks and eats one seed after another, making rough, irregular incisions, but does not enter the seed. Some of the larvae, after boring out of the pods, return and pupate within them, but the majority pupate in the ground or under dry leaves at the base of the plant. This pest does not infest dried beans in storage, but it frequently destroys almost every bean in a crop of bush limas on ground where they are grown for the first time. It is so well distributed over California, even where lima beans have never been grown, that it would seem to be indigenous, breeding in native species of *Lupinus*, which are abundant over the greater part of the State. Observations indicate that late lima beans are injured more than early ones. There are apparently two or more generations a year, so that late varieties are attacked not only by moths migrating from native lupins, but also by a generation that has developed from early limas grown in the vicinity. In a dry season, the lupin pods dry up early, and the emerging moths are forced to seek other food, thereby causing a heavy infestation in early limas, while if there is sufficient moisture there is an almost continuous crop of lupin pods and relatively few moths attack the early beans. A greater percentage of the crop seems to be damaged in small isolated fields than in large areas.

Other insects damaging beans and causing injury frequently attributed to *E. zinckenella* are *Diabrotica soror*, Lec. (western spotted cucumber beetle), which devours part of the pod of the common bean (*Phaseolus vulgaris*) and some of the bean beneath it, but only attacks pods in which the beans are watery; *Bruchus quadrimaculatus*, F. (southern cowpea Bruchid), confined almost entirely to black-eyed cowpeas [*Vigna sinensis*], but attacking limas and several varieties of other seeds in storage; and *B. obtectus*, Say (common bean Bruchid), which inserts numerous eggs inside the pod of common beans or black-eyed cowpeas, and breeds, generation after generation, in stored bean until all available food has been consumed.

Van Dyke (E. C.). **The Value of Life History Studies from the Viewpoint of Systematic Entomology.**—*Jl. Econ. Ent.*, xix, no. 5 pp. 703–707. Geneva, N.Y., October 1926

The author's abstract of this paper is as follows : Properly to know and place each insect, one must have an exact knowledge of its structur —insect morphology ; an understanding of the uses of these structure and the causes of their appearance—insect physiology ; an idea of th ways in which these have been modified through time—insec phylogeny ; how they are developed—insect embryology an metamorphosis. Insect biology and insect morphology are of equa importance to the student of systematic entomology and this i illustrated in the growth, transformation, adaptation and sexua needs of certain species.

Smith (H. S.). **The Fundamental Importance of Life-history Data in Biological Control Work.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 708–714 Geneva, N.Y., October 1926.

It is now known that it is not possible to determine the habits of parasite by its systematic relationships ; there are, for example, groups of Hymenoptera that are largely primary in habit and other groups that are largely secondary, but experience has shown that species belonging to either group may be found in the other, and it is therefore necessary to determine the exact host-relationship of any parasite before any attempt is made to use it in biological control. The colonisation of adult primary parasites may ordinarily be considered as safe, while the placing out of any immature stages is accompanied by considerable risk, which can only be avoided by thorough investigation into the life-histories and habits of the secondary parasites that attack them. It is essential that the oviposition habits of the parasites be accurately determined, for while most parasites issuing from larvae or pupae of their hosts have oviposited in one or other of these stages, several groups are known to deposit their eggs in the eggs of the host, where they remain quiescent until the host hatches and develops. There is also the question of mating. Almost all parasitic Hymenoptera deposit eggs that will develop irrespective of whether they have been fertilised or not, but the majority of them produce males only from unfertilised eggs. In introducing most exotic species, therefore, it is essential that mating take place in order to increase the stock, and some species will only mate under certain definite conditions. The time that must elapse between emergence and mating must also be determined ; most Hymenopterous parasites mate almost immediately after emergence, but many Tachinids will mate only after some time has elapsed, and some of the Coccinellids require an interval of 10 or 12 days. This necessitates keeping them in confinement until they have reached the proper stage of maturity. Parthenogenesis may have an important bearing on the establishment of an exotic parasite in a new region, as unless a certain proportion of females are produced the colony cannot persist long enough to become permanently established. For example, when *Schedius kuvanae*, How., the egg-parasite of the gipsy moth [*Porthetria dispar*, L.] was introduced into Massachusetts from Japan, the early shipments produced only a small number, which were exclusively females. These were therefore allowed to deposit part of their eggs in the eggs of *P. dispar* and were then placed in a refrigerator to prolong their life, while the parasitised gipsy moth eggs were placed in an incubator to advance their development as rapidly as possible. From these eggs an abundant supply of male progeny of *S. kuvanae* was reared, and these were used to fertilise the mothers whose lives had been prolonged by refrigeration, these fertilised females being allowed to oviposit in gipsy moth eggs in the usual way. The life-histories of parasite and host insect must be properly synchronised if the parasite is to be effective, for a parasite, even when well established, cannot be of much practical value unless its efficiency can increase concurrently with the increase in abundance of the host. The question of antagonism between primary parasites of two or more species attacking the same stage of the host insect has been largely discussed of recent years, but it may be generally accepted that, so long as the dominant species does not actually show a preference for host individuals attacked by the other species, the total efficiency should be at least somewhat greater than that of either working alone.

KAMAL (M.). **A Study of some Hymenopterous Parasites of Aphidophagous Syrphidae.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 721–730. Geneva, N.Y., October 1926.

As a result of two years' investigations, the author gives an account of the life-histories of the Hymenopterous parasites of aphis-feeding Syrphids of southern California. Occasionally one or other of these parasites appears in such numbers as seriously to hamper the beneficial activities of the Syrphids. A list is given of these parasites and their Syrphid hosts, with notes on their seasonal history and bionomics. The general methods of feeding and respiration of the parasites and the effect on the host are discussed.

SWEZEY (O. H.). **Recent Introductions of Beneficial Insects in Hawaii.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 714–720. Geneva, N.Y., October 1926.

An account is given of the beneficial insects that have been introduced into Hawaii during 1920–25, most of which have been previously noticed. The Aphid parasite, *Lysiphlebus testaceipes*, Cress., introduced from California in 1923, has now been reared from *Aphis sacchari*, Zehnt., *A. maidis*, Fitch, *A. medicaginis*, Koch, and *A. gossypii*, Glov. A large Tachinid, *Archytas cirphiae*, Curran, introduced from Mexico in 1924 against army-worms, was liberated in small numbers without any attempt at rearing, and in about a year had spread all over the Island. *Lariophagus texanus*, Cwfd., *Urosigalphus bruchi*, Cwfd., *Glyptocolastes bruchivorus*, Cwfd., and *Horismenus* sp. were introduced in 1921 from Texas to control four species of Bruchids that infest the pods of *Prosopis juliflora*, which constitute a valuable food for stock.

Insects that have arrived as natural immigrants in Hawaii and have proved to be of economic value include the Ophionids, *Cremastus hymeniae*, Vier., a parasite of *Hymenia fascialis*, Cram., and also of the two important pests, *Nacoleia* (*Omiodes*) *accepta*, Butl. (sugar-cane leaf roller), and *N.* (*O.*) *blackburni*, Butl. ; *Casinaria infesta*, Cress., which has been reared from 8 Pyralids in Honolulu but has not yet appeared in the island of Hawaii; and *Hyposoter exiguae*, Vier., which has only recently appeared as a parasite of army-worms.

DOANE (R. W.). **The Reappearance of** *Harmolita grandis* **and** *Harmolita vaginicola* **in Utah.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 730-732. Geneva, N.Y., October 1926.

Harmolita grandis and *H. vaginicola* (wheat straw worm and wheat sheath worm), which were destructively abundant in 1914 and 1915 in Utah [*R.A.E.*, A, iv, 448; viii, 207], have been much less injurious during the past ten years, but in 1926 from 40 to 70 per cent. of the winter wheat in many fields was killed, and a total infestation of the two generations amounting to 80 per cent. was recorded. It is expected that the infestation will be still heavier in the future, unless the stubble is burned or thoroughly turned under with the plough.

WOGLUM (R. S.). **The Use of Oil Spray on Citrus Trees.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 732-733. Geneva, N.Y., October 1926.

The conclusions reached as a result of the past season's work on oil sprays, particularly against red scale [*Chrysomphalus aurantii*, Mask.] and black scale [*Saissetia oleae*, Bern.] are briefly summarised in this paper, of which only an abstract is published. The quick-breaking emulsions of white oil type, characterised by high viscosity and low volatility, and which leave an oil film on the tree for many weeks, have proved the most effective spray against both armoured and unarmoured scales and red spider [*Tetranychus citri*, McGregor], where used at a concentration of not less than 1½ per cent. of actual oil. Heavy applications at this concentration are apt under certain conditions to injure the tree, retard colouration of the fruit, cause fruit dropping, and increase the abundance of Aphids. Against *C. aurantii* these white types of oil give better results on cutinised surfaces such as fruit and new wood than on old wood, which more readily absorbs the oil. The most effective control is the application of oil sprays followed in a week or two by fumigation. Some oil emulsions can safely be used with sulphur compounds; these, mixed with lime-sulphur in the presence of calcium caseinate, result in a spray that leaves little or no oily covering on the foliage, and does not retard fruit colouration or affect the set. Such sprays are among the most effective against immature unarmoured scales, but are of little value against the armoured scales of *Citrus* trees.

DE ONG (E. R.). **Technical Aspects of Petroleum Oils and Oil Sprays.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 733-745. Geneva, N.Y., October 1926.

Recent work has shown that the adoption of definite specification for insecticidal oils is essential, and much progress has been mad in the study of the physical characters of oils having a bearing o their toxicity. The characteristics, principally physical, that ar generally recognised for the identification of uniform grades of o are briefly described [*R.A.E.*, A, xiv, 645]. The oxidation of th saturated hydrocarbons, which are almost the only constituents the highly refined white oils, when exposed in thin films to sunlight, is not understood, except that it is known that there is an increase in acidity ; this subject is being studied further and may shed considerable light on the reaction of oils on foliage. Insecticidal tests have up to the present been made chiefly on *Chrysomphalus aurantii*, Mask. (red scale), which is a particularly resistant species. Examination showed that when a drop of volatile oil, such as kerosene, was placed on the Coccid, it penetrated throughout the tracheal system, but was frequently expelled almost as rapidly, apparently by the efforts of the insect. A kerosene containing only 2 or 3 per cent. of unsaturated hydrocarbons seemed to have very little effect on the insect. Any volatile oil containing a large amount of unsaturated hydrocarbons seemed to pass through the entire body cavity, dissolving first the fat bodies and finally even the entire cellular structure of the interior part of the body. Lubricating oils of the non-volatile highly refined type penetrated but a short distance into the main tracheal trunks, but there remained indefinitely, apparently killing by suffocation. A high content of unsaturated hydrocarbons materially hastened the time of death.

The effect of oils on plants is discussed. Besides the acute effects manifested by defoliation, twig and fruit injury, there is an apparent disturbance of physiological processes of the tree and fruit manifested by slight delay in ripening and forced dropping of *Citrus* fruits and French prunes. This is particularly noticeable with the less volatile oils, which give a very lasting film. This may possibly be overcome by the use of non-volatile oils early in the season and of oils of greater volatility late in the development of the crop. Tests were made to determine the drying ratio of fruit under various treatments. The drying ratio of unsprayed fruit was 3 : 03 to 1, that of kerosene 3 : 14 to 1, light lubricating oil, viscosity 50 seconds Saybolt, 3 : 55 to 1, and a lubricating oil of viscosity 70, 3 : 70 to 1. These were all highly refined oils, so that the viscosity test alone is largely definitive. These tests indicate serious disturbance of the normal plant functions. Applications of oil sprays to immature fruit did not show such striking changes in the fruit when mature. Experiments to determine the effect of dormant sprays on deciduous trees gave very varying results. The nature of the oil emulsions that are of practical value is discussed. There are two types of oil emulsions, namely, oil-in-water, in which the oil is dispersed in globules in the water, and water-in-oil, in which the reverse is found. In the quick-breaking type of emulsion, the water separates out almost immediately, leaving a film of almost pure oil on the leaf surface, thus bringing the oil in direct contact with the insect, and increases the toxicity to such an extent that the almost prohibitive cost for emulsions of the stable type is reduced to a point where they are economically practical for orchard spraying. A table shows the relation between the mortality of *C. aurantii* and the proportion of emulsifier used with white lubricating oils of the so-called neutral type, and demonstrates that the amount of oil lost in the run-off is reduced from 2 per cent. in the original emulsion (where 5 gm. of emulsifier are used to 2·5 gm. of oil) to ·34 per cent., with the emulsifier reduced to ·0078 gm. and the amount of oil remaining constant. A typical formula used was 5·75 cc. (5 gm.) oil, with 244·125 cc. water and ·125 gm. calcium casein mixture (consisting of powdered casein and hydrated lime in the proportion of 1 : 4). This mixture is dissolved in a small amount of water to which the oil is added wholly or in part and the entire amount forced through a small spray pump, thus forming an emulsion that can be used very satisfactorily in an ordinary power sprayer. Such an emulsion can easily be re-formed into a homogeneous mixture by starting the agitator. The quick-breaking type of emulsion should be used only with oils that are known to be almost harmless to the plant at the time the material should be applied. The use of oils of a moderate degree of refinement is dangerous on trees that are not absolutely dormant. A larger proportion of oil is left on the surface than with a stable emulsion, and the thickness of the oil film may be slightly increased by covering certain parts or all of a tree two or more times at one spraying operation.

The next step in progress will probably be the application of pure oil directly to the tree without a carrier or emulsifier, which, of course, requires a decided advance in the present knowledge of oils and their reactions on plants.

Mote (D. C.), Wilcox (J.) & Davis (E. G.). **The Natural "Cleaning up" Habit of Insects.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 745–748, 6 refs. Geneva, N.Y., October 1926.

Attention is called to the habit of certain insects of passing the legs and antennae between the mouth-parts for the purpose of removing powdered materials adhering to them. This is considered to be a natural tendency towards cleanliness, as distinct from irritation caused by some material producing a chemical reaction, and will probably enhance the value of dusting over spraying. In the experiments described, *Diabrotica soror*, Lec., *Blattella germanica*, L., *Forficula auricularia*, L., *Syneta albida*, Lec., and *Crioceris asparagi*, L., were all stimulated to this natural habit, several of the following dusts having produced the stimulus in each case : sodium fluoride, calcium arsenate lead arsenate, sodium fluosilicate, wheat flour, and powdered milk sugar. No attempt was made to determine whether these powders irritate the insects or not. It is thought that there are great possibilities in the utilisation of this habit in the control of insect pests.

List (G. M.). **Some Possibilities in Codling Moth Control.**—*Jl. Econ Ent.*, xix, no. 5, pp. 748–752. Geneva, N.Y., October 1926.

It is pointed out that spraying alone is not sufficient to contro *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth), and that more us should be made of such methods as banding, orchard sanitation and th collection of infested fruit. The possibilities of ovicides and of trap for the adults, which have recently been the subjects of study, ar discussed [*R.A.E.*, A, xiii, 125].

Packard (C. M.) & Campbell (R. E.). U.S. Bur. Ent. **The Pea Aphid as an Alfalfa Pest in California.**—*Jl. Econ. Ent.*, xix, no. 5 pp. 752–761. Geneva, N.Y., October 1926.

During the past few years, lucerne in southern California has bee badly injured in late winter or early spring by *Illinoia pisi*, Kalt. (pe Aphid). These outbreaks have followed mild winters with low rainfall through which many viviparous females survived to start a new infestation in the spring. The first growth of lucerne in the infested fields was destroyed, the second growth weakened, and weeds grew in abundance as a result of the weakening of the lucerne crop. With the coming of hot weather the outbreaks died down, owing to the development of insect enemies and of the occurrence of a fungus, *Empusa* (*Entomophthora*) *aphidis*. The main principle underlying cultural control is the prevention or elimination of all growth in the fields during the winter. Spring outbreaks may apparently be prevented by stopping irrigation in autumn, by making the last cutting after growth has stopped, by removing all growth during the winter by heavy pasturing or by heavy cultivation, and by studying the condition of the field to determine the time of the first spring irrigation. For dormant fields, irrigation should be delayed until warm growing weather and then practised copiously, while for fields naturally starting growth early, development should be stimulated by early irrigation. The objections usually raised against winter pasturing are discussed ; the authors conclude from their observations that if properly done this is beneficial and profitable rather than otherwise, irrespective of its virtues as an Aphid control.

The best form of practical control is the burning over of the fields. This to be effective requires the use of special and expensive machinery, but many farmers have found it worth while, as the first crop can be saved from Aphids, and weeds kept down at the same time. All vegetation must be removed from the entire field and its surroundings, if reinfestation is to be prevented. Lucerne plants apparently are not injured by the burning and immediately afterwards put out abundant and vigorous new growth. The type of machine generally built by the farmers consisted of a low-wheeled carriage with a horizontal feed pipe across the back, to which is fastened a series of burners so placed as to project their flames downward and backward against the ground. The fuel is supplied to the burners under pressure from a tank and air compressor on the burner carriage or from an ordinary spray outfit. The fuel is vaporised by heat in coils of pipe before reaching the nozzle, and is ejected under pressure and burned as gas. The burners, however, easily become clogged with carbon deposits, and in a better type of machine, such as those used in the campaign against the European corn borer [*Pyrausta nubilalis*, Hb.], the fuel is not vaporised inside the burner, but is forced as a liquid under high pressure through spray nozzles, especially constructed to withstand high temperatures. This spray burns at a distance of several inches from the nozzles, and no carbon deposit is formed. The flame thus produced is of considerably greater volume than that of the generative burners, and the heat is more evenly distributed, persistent and penetrating. More fuel is consumed, but cheaper oil can be used, the work can be done more rapidly, and a second burning can frequently be dispensed with.

Spraying experiments were unsatisfactory except on very small lucerne, where 250 to 300 gals. of spray per acre was used at not less than 250 lb. pressure. Fish-oil soap and distillate emulsion were the best sprays tested. The effect of nicotine was largely spoilt by low temperature and windy conditions. Granular calcium cyanide applied at the rate of 20 lb. an acre killed approximately 95 per cent. of the Aphids when used under favourable atmospheric conditions, with very little injury to the plants, and, although more expensive than spraying, can be profitably used on lucerne that is too young to be burned.

Tests of this material on older lucerne plants were rather inconclusiv Early close cutting and removal of lucerne hay, followed by irrigatic within a week or ten days, resulted in rapid disappearance of Aphids c several occasions. Remedies tried and found valueless were brus dragging, aphidozers and cultivation after active growth had begun i the spring. An attempt was made to introduce the Coccinelli *Hippodamia convergens*, Guér., into the infested areas, and although was not successful, it indicates possibilities in the future.

WILCOX (J.). **The Lesser Bulb Fly,** *Eumerus strigatus*, **Fallén, i Oregon.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 762–772, 1 pl., 3 fig 8 refs. Geneva, N.Y., October 1926.

Eumerus strigatus, Fall. (lesser bulb fly) has now become establish in the commercial onion and narcissus producing parts of Orego the larvae having also been found in hyacinth bulbs and once in tul bulbs. The stages are briefly described, and the seasonal history summarised as follows: The insects pass the winter as fully grow larvae, mostly in the bulbs but in some cases in the soil. Durin March and April the larvae leave the bulbs and migrate into the upp two inches of soil surface and pupate. The flies emerge and are acti during April and May. Mating and egg-laying take place at this tim The second generation of flies emerges during June, July and Augus These flies lay the eggs that produce some of the overwintering larva although some of these larvae may pupate and emerge as flies September, and thus produce a partial third generation.

Whether the pest attacks healthy bulbs has not yet been determine apparently the larvae are capable of doing so, but they much pref to attack unhealthy ones, particularly those infested by *Tylench dipsaci*, Kühn. Hot water treatment, in which the bulbs are immerse in water at 110·5° F. for three hours, as for *T. dipsaci*, will kill a larvae present in the bulbs. This treatment alone is not sufficien however, as it is impossible to remove all bulbs and parts of infeste bulbs from the ground when digging, and also larvae are apt to dro from the bulbs when handled. A great number of larvae can be kille by destroying all soft and decaying bulbs at the time of digging, an the planting should be removed from one locality to another each yea As these remedies are only applicable after the damage by the larvae done, preventive measures were tried experimentally in the field, usin Dormoil 2 per cent., mercury bichloride 1 oz. to 10 U.S. gals. wate and white oil 4 per cent. These were applied during April and May intervals of eight days. The mercury bichloride was dissolved in concentrated hydrochloric acid at the rate of 1 oz. $HgCl_2$ to 1 oz. HC Both this and Dormoil caused considerable leaf scorching, but did n seem to damage the bulbs. It is hoped to continue these experimen next season, as both mercury bichloride and white oil emulsion ga promising results.

CASSIDY (T. P.). U.S. Bur. Ent. **The Arizona Cotton Boll Wee Problem.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 772–777. Genev N.Y., October 1926.

The Arizona boll weevil [*Anthonomus grandis thurberiae*, Pierce] a variety specially adapted physiologically to thrive in arid regions, ar has for its food *Thurberia* or wild cotton, which is found throughout the south-western portions of Arizona. In two counties it has already attacked cultivated cotton, to which it is a serious menace. Field tests have shown that weevils taken from *Thurberia* readily infested cultivated cotton and caused considerable damage. It is thought that this weevil may be potentially a more serious menace to cotton in the drier regions than either the pink bollworm [*Platyedra gossypiella*, Saund.] or the typical *A. grandis*, Boh., is in the regions in which they occur. For one thing, the Arizona weevil prefers bolls for oviposition, so that measures to make a crop mature in advance of the weevil, such as are employed in the south against the typical form, would be of no advantage. Again, this weevil shows a very high degree of resistance to extreme conditions and is able to go into a state of at least partially suspended animation whenever conditions become unfavourable, and it can maintain this for a very long period. Hibernation studies showed that about 70 per cent. of the weevils survived under conditions about as severe as are ever expected in the district, whereas only 2 to 5 per cent. of *A. grandis* survive under normal conditions. Moreover, this variety is ideally adapted for transportation. A high percentage of individuals of the last generation in the autumn form very hard cells in the cotton seed or lint, and most of these are gathered with the picking. They go through the gin easily, and many of them will be carried along with the lint and introduced into the bales of cotton. It is suggested that some definite action should be taken to prevent the Arizona boll weevil from becoming established in cultivated cotton, as approximately one-sixth of the normal cotton crop of the United States is produced in the western area, where *A. grandis* cannot thrive sufficiently to cause any damage, and it would seem possible to double this production within the next few years, provided that the territory remained free from insect pests.

MOTE (D. C.). **Codling Moth attacks Cherries.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 777–778. Geneva, N.Y., October 1926.

Reports have been received from various counties in Oregon of codling moth [*Cydia pomonella*, L.] attacking cherries, the fruit being injured by the entrance tunnel and the feeding of the larva on the pulp near the seed, followed by brown rot and other diseases. Several varieties were attacked.

THOMPSON (B. G.). **The Peach and Prune Root-borer injurious to Cherries.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 779–780. Geneva, N.Y., October 1926.

A large cherry orchard in Oregon was found to be heavily infested with *Aegeria* (*Synanthedon*) *opalescens*, Edw. (peach and prune root borer), a number of trees having already been killed, while many others were in a dying condition. Examination of many trees showed no borers present above the union of the bud and root stock, the latter being *Prunus mahaleb*. Seedling cherries and cherries on seedling cherry root stock were quite free from borers, even when immediately adjacent to the heavily infested orchard. The life-history of the borer on cherries is about the same as on other plants. The larvae were found to pupate early in May in 1926, and adults were on the wing in late May and early June. A number of four-year-old trees were treate with paradichlorobenzene, ½ oz. being placed in a ring around the tr at least 2 in. from the trunk, and the ring covered to a depth of 2 4 in. A fortnight later all the larvae on the treated trees were dea Up to date (8 months later) no injury was apparent to the trees. Mar larvae were found to be infested with Hymenopterous parasites, but t adults of these had not emerged at the time of writing.

HARTZELL (A.). **Naphthalene Fumigation of Greenhouses.**—*Jl. Eco* *Ent.*, xix, no. 5, pp. 780–786, 1 fig. Geneva, N.Y., October 1926.

Commercial flake or ground naphthalene has proved a successf fumigant, used at 1·5 oz. to 1,000 cu. ft. of air space with exposu overnight, in greenhouses infested with *Tetranychus telarius* (red spide *Heliothrips femoralis* and *Thrips tabaci*. The precautions necessa to avoid injury to the foliage are explained. The temperature shou be maintained at about 70° F., with a relatively high humidity of abo 80 per cent. A slow, even volatilisation of the material over a peri of at least six hours is essential to protect the foliage and at the sa time kill the maximum number of the pests. The best method obtaining this was an oil lamp covered with a truncated cone of she iron pierced with a few holes for ventilation, on the top of which t naphthalene was placed in a flat-bottomed pan. By regulating t height of the flame it was possible to adjust the rate of volatilisatio The mortality among thrips and red spider as the result of repeate fumigation is shown in a table, all being killed after three applicatio and a list of 40 plants that have withstood fumigations is given ; th shows soybean [*Glycine hispida*] to be the most susceptible to injur while buckwheat [*Fagopyrum esculentum*], radish, red clover and toma sometimes show slight injury, but recover fully within a week or days. Naphthalene is the only fumigant as yet discovered giving ad quate control of thrips and red spider.

VAN LEEUWEN (E. R.). U.S. Bur. Ent. **A Contact Spray for the Control of the Japanese Beetle** (*Popillia japonica*, **Newm.**).—*Jl. Eco* *Ent.*, xix, no. 5, pp. 786–790, 3 refs. Geneva, N.Y., October 192

Sodium oleate soap, when used in solutions not exceeding 6 lb. 50 U.S. gals. of water against adults of *Popillia japonica*, Newm., d not injure even such tender foliage as peach, but at this strength d not give adequate control of the beetle. An oleoresin of pyrethru obtained by making an alcoholic extract of the whole flower-heads *Chrysanthemum* (*Pyrethrum*) *cinerariaefolium* was then combined wi the soap, the most successful formula being 9½ oz. oleoresin with 5 l oleic acid, U.S.P., 11·2 oz. sodium hydroxide and 50 U.S. gals. wate In cages, this spray resulted in an average of 100 per cent. mortality the end of 24 hours. In the field, spraying with a bucket pump gave average mortality of 95·2 per cent., while a power outfit, operating o gun at 250 lb., gave an average of 98·2 per cent. The difficulty applying the spray with complete thoroughness will be the limiti factor in obtaining good results in practical field work. The best resul were obtained by spraying under conditions of high temperature a low humidity. No injury to tender foliage resulted from tw applications.

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